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FOREWORD



Royal Air Force Tornado GR.Mk 1 and F.Mk 3 aircraft deployed to Saudi Arabia.

The 1991 Gulf War, Operation Desert Storm, frequently called 'the first Gulf War' even though war in the Gulf between Iraq and Iran had raged for much of the previous decade, changed the face of warfare. It showed air power in a devastating new light.

In August 1990, Iraq invaded Kuwait. The international outrage that followed saw a hitherto unimaginable Coalition of allied states demanding an Iraqi withdrawal. When this did not happen, the US-led Coalition unleashed air power in all its modern fury.

This was a carefully choreographed campaign. In the first few hours the Coalition systematically took down Iraq's Soviet-model integrated air defence system, not by destroying its airfields, but by denying it command and control.

The nation's radars were effectively blinded, its ground control intercept operators left voiceless. Those interceptors

that managed to launch on the first night were literally flying in the dark. When they stumbled upon targets, Coalition jamming rendered their radars useless. And then the F-15 Eagles cut them down.

On the ground, the hardened command and control facilities designed to ensure the nation's safety from air attack were being hit by precision-guided weapons dropped by unseen attackers. Stealth was revealing the US Air Force's ability to attack undetected and at will.

But this was not an entirely one-sided conflict. Applying Cold War tactics designed for all-out war in Europe led the Royal Air Force to use flawed tactics against Iraqi airfields and British Tornados suffered badly.

When the ground war began little more than five weeks after the first bomb had fallen, however, Iraq was already beaten. Within 100 hours a ceasefire had been agreed, but not before the A-10s, Apaches



A Free Kuwait Air Force A-4KU Skyhawk pilot.
Both Ian Black

and Cobras had wreaked a terrible toll on vehicles fleeing north from Kuwait City.

From precision-guided weapons to the stealthy F-117 Nighthawk and the absolute dominance of US fighter pilots, this is the story of a conflict that redefined air warfare.

Paul E Eden
Editor

Cover main image: Ian Black.

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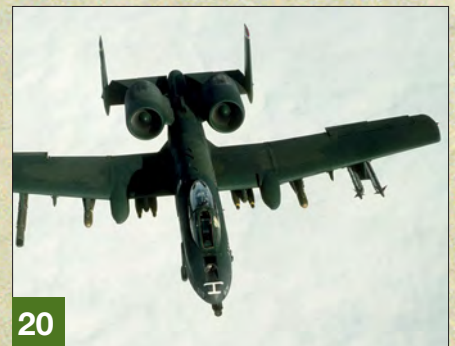
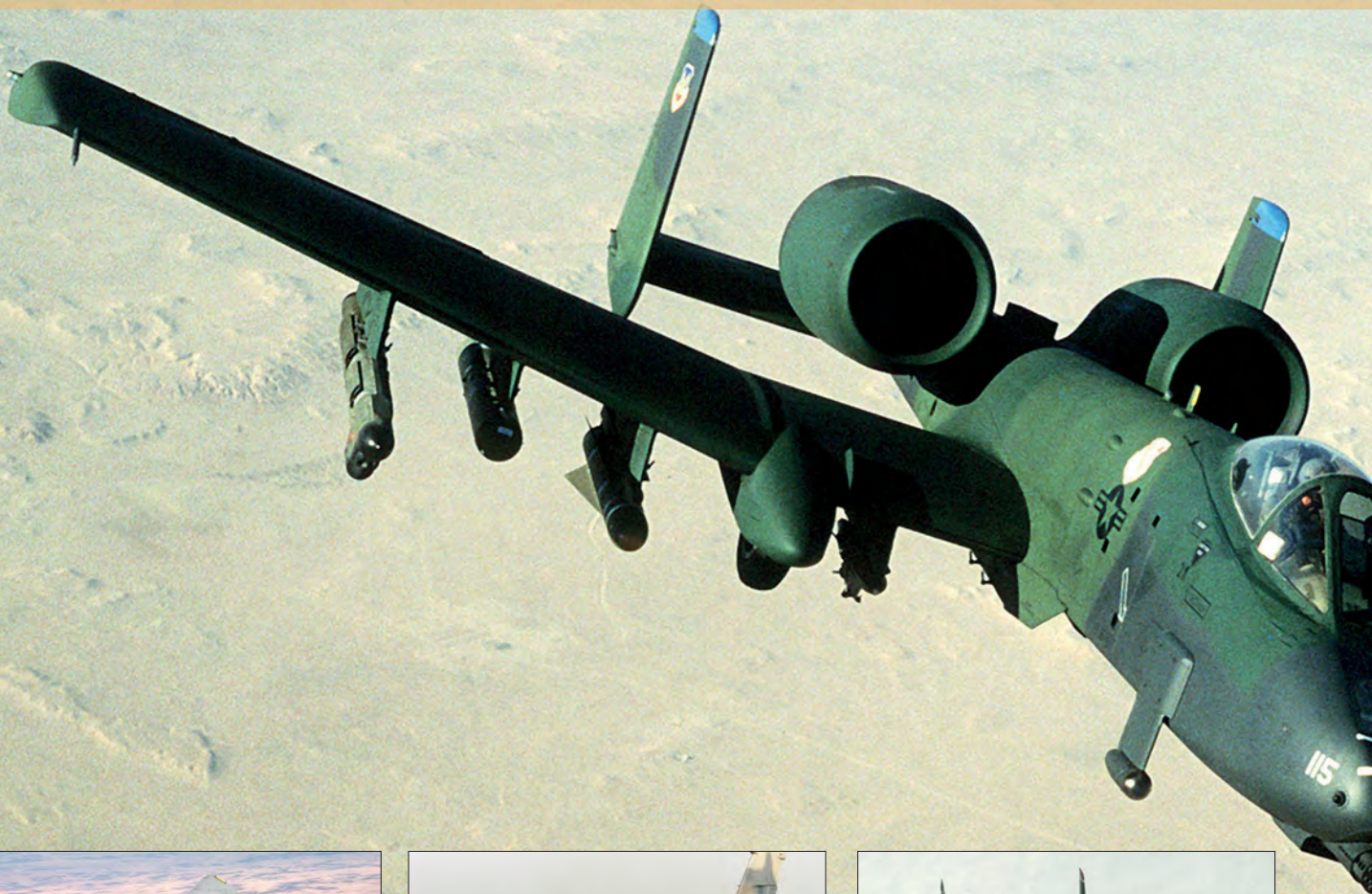
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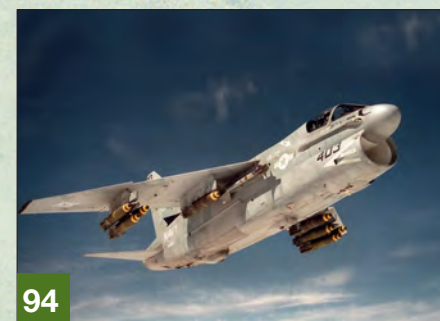
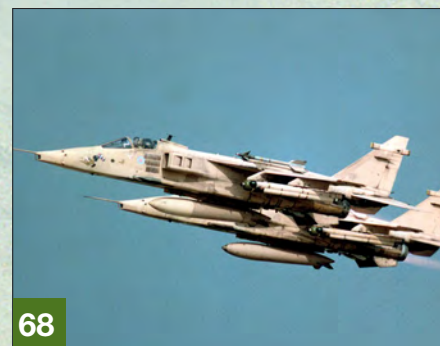
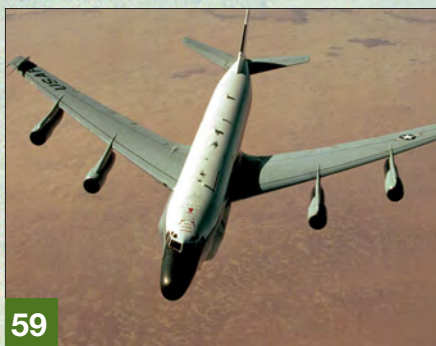


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THE ROAD TO WAR

Kuwait's long, complex history initially led it into conflict with Iraq in 1961. Then, British assistance was enough to deter the aggressor, but when Saddam Hussein's forces invaded the tiny nation and threatened Saudi Arabia in 1990, an international force assembled to back United Nations demands for their withdrawal

On July 1, two squadrons of Royal Air Force fighters landed in Kuwait, adding airborne firepower to Royal Marine Commandos helicoptered ashore from a carrier under way in the Gulf. While RAF transport aircraft established an airbridge back to the UK and moved men and materiel in-theatre, bombers and maritime patrol aircraft reached the beleaguered state. With an area less than a tenth that of the UK, the tiny, oil-rich Arab nation was under imminent threat as Iraqi forces moved south from Baghdad.

This was not the build up to Iraq's invasion of Kuwait in August 1990, but the British response to Iraqi aggression in 1961, after Kuwait had gained full independence. The autonomous sheikhdom of Kuwait had been founded in 1756 on the basis of a colony perhaps dating as far back as 3,000BC. In 1776 the British East India Trading Company established an outpost in the sheikhdom and in 1899, as the threat of Ottoman and German influence arose, Kuwait became a self-governed protectorate.

Recognition of Kuwait as an 'independent government under British protection' in 1914 further reinforced its position, as did the agreements forged on its boundaries with Iraq and Nejd (which became Saudi Arabia in 1932) between 1922 and 1933. The discovery of oil in 1938 dramatically altered Kuwait's economy and world standing; by the late 1950s the earlier agreements between it and the UK were becoming obsolete.



In June 1961 Kuwait therefore gained independence, although the UK remained committed to its protection should the Kuwaiti ruler request military intervention. The situation rapidly deteriorated, as the Iraqi leader, Abdul Qarim Qassem, declared Kuwait part of Iraq on June 25 and began moving troops and equipment to threaten it. The UK's reaction was immediate and decisive. Air, sea and land

forces moved swiftly to the theatre. Two Hawker Hunter squadrons were soon in place, along with Avro Shackletons, English Electric Canberras and a varied transport fleet.

Britain's powerful military display may have had no influence on the Iraqi leader, but his troops advanced no further than Basra and by July 20 the British had begun to withdraw.



Hussein in Power

Following a coup in 1968, the Arab Socialist Ba'ath Party seized power in Iraq. Among the key players in the coup, Saddam Hussein became the country's vice president. Serving under Ahmed Hassan al-Bakr, Hussein wielded considerable power as the older man's health began to fail. He further secured his position by establishing security forces

loyal to him rather than the president and in 1979 al-Bakr resigned.

Hussein's presidency was immediately brutal, especially against Kurdish rebels to the north. In 1980 he engaged Iran in what became a long-running and bitter conflict, early Iraqi gains soon turning to a bloody stalemate in which Hussein showed his willingness to employ chemical weapons.

A UN ceasefire ended the war on July 19, 1988 and while some commentators predicted an Iraqi attack on Syria, it was to Kuwait that Hussein turned his attention. A political offensive preceded invasion, Iraqi Foreign Minister Tariq Aziz claiming on July 16, 1990 that Kuwait and the United Arab Emirates were guilty of aggression against Iraq and of tapping into its oil reserves. He also claimed that



The US response to Iraqi aggression was swift and powerful, the 1st TFW immediately sending its F-15C Eagles in defence of Saudi Arabia. *DoD*



Although a variety of Kuwaiti military aircraft, including Mirage F1s, Hawks, Skyhawks and Pumas escaped to Saudi Arabia, it was the A-4KU that formed the backbone of ongoing Kuwaiti resistance. *Wikimedia Commons*

their production was artificially reducing oil prices and limiting Iraq's economy.

Some of the basis for the claims was made clear on the 18th, when Baghdad claimed that part of Kuwait was rightfully Iraqi territory and oil harvested from the region had been 'stolen', denying Iraq the profit from US\$2.4 billion, for which it demanded reparations from Kuwait. In response, on July 19 the Kuwaiti government requested that the Arab League intervene politically, and on the 23rd Saudi Arabia's military went on alert.

On the 25th, the US ambassador to Iraq, April Glaspie, told Hussein that the

country would not intervene in the crisis, but apparently asked why his troops were massing to the south. Controversy surrounds the meeting's outcome and there is uncertainty as to what exactly was said, but some reporters have suggested that Glaspie's statement on non-intervention was taken as a tacit indication that the US would not react militarily to an invasion of Kuwait.

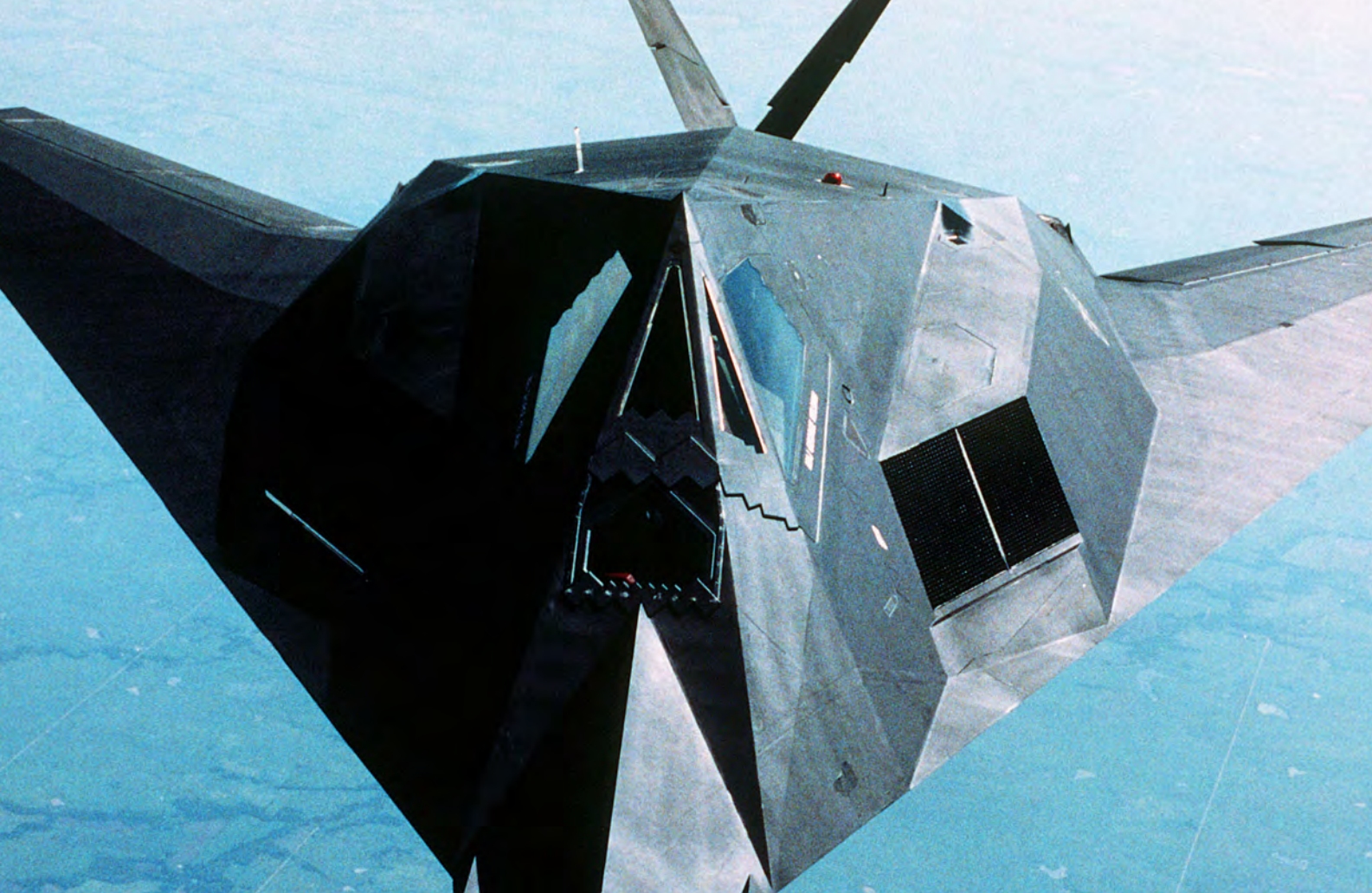
The following day the Organisation of the Petroleum Exporting Countries fixed oil prices below those demanded by Iraq, raising them on the 27th under pressure from Hussein. The US reacted by reducing

farm credits to the country and banning military technology transfer.

By the 31st, Iraqi troops were directly threatening the Kuwait border, but Western analysts interpreted the troop movements as sabre rattling, even as the Iraqis made claim to the Kuwaiti islands of Bubiyan and Warba.

Invasion

During an August 1 meeting, Iraq also demanded that Kuwait write off US\$5.5 billion in loans provided during the Iran-Iraq war. After the Kuwaiti officials refused, the Iraqis abandoned the meeting and their troops began to mobilise.



▲ If further evidence of the USA's resolve were required, then none better could be found than in the relatively overt deployment of the F-117. The Nighthawk had previously been used in combat only against Panama, more by virtue of the accuracy of its weapons system than its stealth capabilities. *DoD*

◀ The Coalition that gradually formed to resist Iraq required unprecedented levels of co-operation between its members. Here USAF and Saudi F-15C Eagles fly a joint Desert Shield sortie. *CMSgt Don Sutherland/USAF*

The final preparations for invasion were carefully planned and the initial movement well concealed. Through satellites and listening stations, Western intelligence only became aware of Hussein's intention a few hours before Iraqi Republican Guard units advanced across the border at 02:00hrs local time on August 2, 1990. Even then, the West expected Iraq to stop at taking the disputed region, but its army continued to take the whole of Kuwait and pose a real danger to Saudi Arabia.

The Emir of Kuwait, Sheikh Jaber Ahmed al-Sabah, moved with members of his government to Saudi Arabia,

while Kuwaiti military units mounted what resistance they could. Later in the day, UN Resolution 660 demanded the immediate withdrawal of Iraqi forces, while the US froze Iraqi and Kuwaiti assets and outlawed trade with both nations.

In a key development on August 6, Saudi Arabia's King Fahd requested that his allies send military units to the country to help defend against continued Iraqi aggression. The Saudi military was well equipped and, at least on paper, well trained, but Iraq's forces had been battle hardened in almost a decade of conflict and posed an overwhelming threat.

Now Hussein's troops began rounding up Westerners trapped in Kuwait, while he announced that his invasion was 'irreversible'. United States President George Bush responded with Operation Desert Shield, which delivered the F-15C/D Eagles of the 1st Tactical Fighter Wing, based at Langley Air Force Base (AFB), Virginia, directly into Saudi Arabia on the 7th. As work continued to build and strengthen a Coalition of unprecedented scope, forces continued to pour into the region from the US and Europe, while Bahrain, Qatar and the UAE also stood ready to fight. ❖



SHIELD BECOMES STORM

From the moment the Coalition attacked in the early hours of January 17, 1991 and Desert Shield became Desert Storm, it was clear that the Iraqi military had been outclassed at every level

On November 29, 1990, the UN passed Security Council Resolution 678, authorising its members to use 'all necessary means' to force Iraqi forces out of Kuwait if they had not withdrawn by January 15, 1991. After last-ditch talks between Iraqi Foreign Minister Tariq Aziz and US Secretary of State James Baker on January 9 failed, the world waited.

January 15 came and went without Coalition action and it seemed that Hussein's prediction to his people that the US and its allies would not fight had been correct. The events that began unfolding at 02:38hrs on the 17th soon proved him wrong. Three USAF MH-53J helicopters, acting as pathfinders, led nine US Army Apaches 30 miles (48km) inside Iraq to destroy two early warning radar sites 35 miles (56km) apart.

While the so-called Task Force Normandy was taking out the radars, F-117s were playing havoc with C2 centres, including the IOC at Nukhayb, which combined with the Apaches' efforts to create a 60-mile (97km) wide hole through which the main strike force of non-stealthy

aircraft, including F-111F bombers and F-15 Strike Eagles on anti-*Scud* missions, could enter Iraq largely undetected.

First bomb

Having dropped the F-117's first bomb in combat against Panama on December 19, 1989, Major Greg Feest was also chosen to deliver the first bomb of Desert Storm. He recalls: "I was call sign Thunder 36 and my wingman, Captain Dave 'Dogman' Francis, was Thunder 37. We rendezvoused with the KC-135s, refuelled and headed north, towards Iraq, flying on each wing of the tanker. At approximately 02.30 I topped off with fuel, 'stealthed-up' my aircraft and departed the tanker. My target was the underground IOC near Nukhayb, southwest of Baghdad.

"As I approached the target area, I armed my bombs and checked the aircraft's systems. I found the target on my infrared [IR] display and concentrated on tracking it. I glanced outside the cockpit and everything was dark except for a few lights in the town. It appeared that no one knew I was in the sky.

"Looking back at my display, the laser began to fire as I tracked the target. I waited for the 'in range' message then depressed the 'pickle' button. Several seconds later the weapons bay doors snapped open and I felt the 2,000lb LGB depart the aircraft. The bomb appeared at the bottom of the display just before it hit – at exactly 02.51 I saw it go through the cross hairs and penetrate the bunker. The explosion came out of the hole the bomb had made and blew the bunker's doors out.

"I turned 210 degrees left towards my second target, an SOC at the H-3 airfield in western Iraq. I looked out in front and saw tracers, flashes and flak all over the place. The country had come alive with more triple A than I could ever imagine. I watched several SAMs launch and fly through my altitude but none appeared to be guided.

"Still, the intense barrage fire in my target area was scary. I decided to ignore what was happening outside my jet, lowered my seat and concentrated on the displays. I dropped my second



The Eagle dominated the airspace over Iraq. This 58th TFS jet totes AIM-7, AIM-9 and the new AIM-120 on a Desert Storm sortie.
TSgt Fernando Serna/USAF

bomb and turned as fast as I could back towards Saudi Arabia. I don't think I ever manoeuvred the F-117A as aggressively as I did coming off my second target. Having made it safely out of the area, my thoughts turned to Dogman, who was one minute behind me. I knew he'd flown through the same air defences I had. I didn't think he'd make it.

"Just prior to crossing the border into Saudi Arabia, I performed my 'de-stealth' procedures. My task now was to find the post-mission tanker. After confirming it was on-station, I headed for the re-join point. At a pre-designated time I called Dogman on the radio. I prayed I would hear a response. I didn't, so I waited several seconds and tried again. This time I heard him answer."

Iraqi defence

Popular myth would have it that the Iraqi's failed to rise in defence and that their anti-aircraft defences were erratic and poorly executed. All of this was effectively the case, since the country's integrated air defence system had been designed on Soviet lines, with a complex command chain and using interceptors directed by ground controllers.

That command and control system had been all but disabled, leaving AAA gunners and missile batteries with little choice but to shoot at where they thought Coalition jets were, or would be – many crews returned with tales of how fierce, yet undirected the AAA had been.

A handful of MiGs and Mirages also made it into the air, flying under limited



Major Greg Feest flew F-117A '816, parked in the foreground, to drop the first bombs of Operation Just Cause against Panama and Desert Storm. *USAF*

OPERATION DESERT STORM

This MH-53J Pave Low flew with the 20th SOS, the unit that guided the Task Force Normandy Apaches into Iraq. *Andy Hay/Flyingart*



On the first night, the 48th TFW's F-111Fs were tasked against C2 and other key targets deep inside Iraq. *Andy Hay/Flyingart*



control from the ground. Their pilots found no shortage of targets, but Coalition jamming was so effective that they struggled to maintain radar locks for their missiles, while all the time operating under the considerable threat of the F-15 CAPs.

A MiG-29 that attempted to engage F-15Es flew into the desert floor as it manoeuvred, while a Mirage F1 loosed a missile at an EF-111A. The weapon detonated in the Raven's chaff cloud, causing a fireball that the US crew perhaps interpreted as the Mirage hitting the ground – they may also have seen the MiG crashing, since the F1 returned to base.

Engagements between MiGs, Mirages and Eagles continued over the next few days and misreporting, propaganda and the fog of war have subsequently generated considerable confusion as to the exact situation. The Eagle undoubtedly won the day, however, and continued winning, as Cesar 'Rico' Rodriguez (Citgo 11) and Craig 'Mole' Underhill (Citgo 12), flying with the 58th TFS, confirmed on Desert Storm Day Three.

Eagle air-to-air

The pair had received an airborne re-tasking from a high value asset CAP to protect a strike package. "We were re-rolled to provide protection for a strike package that had not been on the ATO [the daily Air Tasking Order] – 36-38 F-16s and F-4Gs," recalled Rodriguez.

As the strikers came off target, AWACS informed Rodriguez that there were bandits off his right wing at 13 miles. "At 13 miles I had no option but to disengage without any SA [situational awareness], so I directed an in-place turn, jettisoned wing tanks and put my radar into the location of the target.

"I locked onto a target at 8 miles and initiated my ID matrix, at which point I had an RWR indication that a Slot Back radar [MiG-29] was locked onto me. I notched to the south and passed as much information to Mole as I could. My concern was self-preservation, so I now had 570-580kt on the jet, I was well below 500ft and trying to stay on the beam while my ECM and chaff did all that they could."

Mole locked the bandit up and called an RC-135 to secure positive confirmation that the target was a MiG-29. Neither Rico nor Mole knew it yet, but a second MiG-29 was 12 miles (19km) behind its leader. Streaking south, Rodriguez looked over his right shoulder to see if he could spot it: "Mole fired an AIM-7 and as he called 'Fox 1', I looked over my left shoulder and saw his missile come off and fly out over the top of my tails.

"As the missile motor burned out I looked to the left of the last source of smoke, at which point I picked up the silhouette of a MiG-29 roughly 4 miles off of my right wing. Shortly after that there was nothing left; there was the silhouette and then, seconds later, there was literally nothing.

"We received another call from the western AWACS: "Second group, north, 10," and executed an in-place check turn to the north. I looked up and saw a smoke trail – not a missile trail, but engine smoke – so I put my radar out there and Mole and I simultaneously locked him up.

"We started going through our ID matrix and the target displayed a friendly electronic return to both of us. I directed a break lock and re-lock, but the same thing happened. I directed a VID [visual ID] pass and pushed Mole out to a 5-mile line-abreast formation. I flew the pass and

at about 4 miles I saw a silhouette that looked a lot like an F-15 or an F/A-18, so I didn't declare him hostile.

"At about 2 miles I looked again. I planned to merge with the bogey at 50ft off of his left wing and as I crossed his wing line I saw that he was a brown and green-camouflaged MiG-29. I declared "Hostile, MiG-29", then began a hard left turn when he started his left turn, so that we had what looked like a classic two-circle flight.

"Initially his turn was level, so rather than stay horizontal I transitioned into a split-S to cut across his circle. Mole was now in the high 20,000ft regime, in a cover position, looking for an option to enter the fight." The engagement quickly turned into a single-circle flight, where both aircraft attempted to out-turn each other in what looks like a constant spiral, but Rico held the advantage because he had managed to get behind the bandit's wing line in the first couple of turns.

"He recognised that I was there, and I think that he may even have seen Mole up there. Now the fight turned into a left-hand descending spiral with me having quite a bit of an energy advantage that I used to close to within firing parameters. As I cut back inside the circle for the AIM-9 there was an opportunity for Mole to come in and take the shot, but I opted to call him off and continue my pursuit. We were now down below 1,000ft.

"He tried to fly a split-S in what looked to me like a 'cobra' [a high angle of attack pitch-up or pitch-down]. I came out of the fight and dipped my wings to pick up visual contact, at which point he impacted the ground. He hit the desert floor and tumbled with all the momentum he had for what seemed like several miles." ♦

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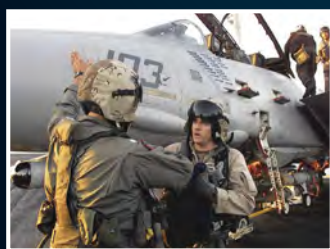
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Several of the Muharraq-based Tornado GR1s received 'Snoopy Airways' titles and appropriate artwork featuring the famous Schulz character. This jet was returning to base after a Desert Storm attack. RAF (AHB)/© UK MoD Crown Copyright 2016

TORNADO ADV AND IDS

In service as a bomber and air defence aircraft with the British and Saudis, the Tornado also flew Desert Storm attack missions with the Italians. Chosen for perhaps the most dangerous missions of the war, it inevitably suffered among the most severe losses

Although the Italian and Saudi air forces also flew the Panavia Tornado in Desert Storm, the Royal Air Force was by far its greatest exponent. Tornado F.Mk 3 fighters deployed first, arriving at Dhahran on August 11, 1990, two days behind the TriStar that had brought the initial UK cadre of administrative personnel to the base. Patrols began immediately, alongside the RSAF's similar Tornado Air Defence Variant (ADV) and US and Saudi F-15C Eagles.

A first squadron of Tornado GR.Mk 1 attack aircraft arrived in theatre later in August, setting up base in Bahrain. A second squadron arrived at the same base, but soon redeployed to Tabuk, where it was established on October 8. The third and last GR1 squadron took Dhahran as its home and was in place by

January 4. The subsequent arrival of six reconnaissance-configured GR.Mk 1A aircraft brought the total GR1 fleet to around 50 jets.

Their crews went to war from 01:30hrs on January 17. Tasked against Iraqi airfields with the JP233 submunitions dispenser, they used Cold War tactics to employ a weapon system designed to be effective in a desperate European conflict. Military planners expected the losses from using JP233 in such a conflict to be high and although the RAF Tornado force suffered the highest Coalition loss rate, senior leaders conceded that it had not been as harsh as anticipated.

The Tornados struck airfield targets at various locations, coming in fast and extremely low, and losing one of their number on the first night. By the end

PANAVIA TORNADO GR.MK 1

- **Powerplant:** two Turbo-Union RB.199-34R Mk 103 turbofans each rated at 16,075lb (71.50kN) thrust with afterburning
- **Performance:** limiting Mach number 1.3, combat radius 750nm (1,390km) on a hi-lo-hi mission
- **Dimensions:** wing span 45ft 7½in (13.91m) spread, 28ft 2½in (8.60m) swept; length 54ft 10¼in (16.72m), height 19ft 6¼in (5.95m), wing area 286.33sqft (26.60m²)
- **Weights:** operating empty 31,065lb (14,091kg), maximum take-off about 61,620lb (27,951kg), maximum stores load more than 19,841b (9,000kg)



The RSAF's nascent IDS force was based at Dhahran. The aircraft wore a standard desert camouflage, while the RAF GR1s and GR1As were rapidly painted in desert pink. RAF (AHB)/© UK MoD Crown Copyright 2016



Hastily upgraded for Operation Granby, the UK contribution to the Coalition, the Tornado F3 was denied air-to-air combat. This aircraft has the four-finned, large underwing tanks, known to crews as 'twenty-two fifties' or big jugs, and to some as 'Hindenburgers'. RAF (AHB)/© UK MoD Crown Copyright 2016



▲ Coded 'FE', GR1 ZA492, was among those painted with a ferocious sharkmouth. Here it carries big jugs and a pair of inert 1,000lb bombs on a training sortie. *Ian Black*



The RSAF flew a mixed air defence fleet of Tornado ADVs and F-15C Eagles. *Ian Black*

PANAVIA TORNADO F.MK 3

- **Powerplant:** two Turbo-Union RB.199-34R Mk 104 turbofans each rated at 16,520lb (73.48kN) thrust with afterburning
- **Performance:** maximum level speed 'clean' at 36,000ft (10,975m) 1,262kt (2,338km/h), combat radius more than 1,000nm (1,852km)
- **Dimensions:** wing span 45ft 7½in (13.91m) spread, 28ft 2½in (8.60m) swept; length 61ft 3½in (18.68m), height 19ft 6¼in (5.95m), wing area 286.33sqft (26.60m²)
- **Weights:** operating empty 31,970lb (14,502kg), maximum take-off 61,700lb (27,986kg), maximum stores load 18,740lb (8,500kg)

of the conflict, six RAF Tornados had gone down in combat, the majority lost to ground fire on missions delivering 1,000lb unguided bombs.

When the emphasis of attack switched from runways and taxiways to individual aircraft shelters, and the threat of low-altitude AAA and SAMs had been appreciated, the Tornados moved up to medium altitudes. Here their low-level optimised attack systems were less than ideal and it was not until the Buccaneer arrived to provide 'buddy lasing' that accuracy improved, since it enabled the Tornados to deliver LGBs. The jets instantly went from dumb bombers to precision strike platforms.

Thanks to the Air-Launched Anti-Radiation Missile (ALARM), the Tornado

force also had its own Wild Weasel capability. After launch, ALARM would climb to high altitude, where it loitered, waiting for enemy radar to come on line. Fired from stand-off range, it could be 'hung up' five minutes ahead of the attacking force, keeping air defence radars off air for their ingress. Since it could remain aloft for 10 minutes, it also covered their egress.

Recce Tornado

Unique at the time in dispensing with traditional wet-film sensors for a videotape recording system, the Tornado GR.Mk 1A employed infrared sensors to provide full day and night reconnaissance capability. Since it worked in infrared it had no requirement

for photoflash at night, conducting its missions entirely in darkness.

Crews generally worked alone and frequently flew with four drop tanks for maximum endurance – missions were typically up to three hours long. Initially considered for post-raid damage assessment, the GR1A eventually found its niche as a *Scud* hunter par excellence, operating at very low altitudes, by night and at speeds up to 580kt (1,075km/h).

The Royal Saudi Air Force was new the Tornado Interdictor Strike Variant (GR1) and ADV, but flew both during Desert Storm. The IDS flew missions similar to those of the GR1 and one was lost in combat. There was a degree of joint operation with the RAF fleet. ❖



▲ Still new to the RAF inventory in 1990, the Tornado F3 had suffered a troubled development. Although closely based on the GR1 airframe, its fuselage was extended to enable tandem semi-recessed Sky Flash missiles to be mounted, while a complex radar and mission system was also installed. The operating conditions in Saudi initially presented serviceability challenges. RAF (AHB)/© UK MoD Crown Copyright 2016



▲ Photographed back in the UK, this GR1A's sensor window, low down on the fuselage side beneath the cockpit, is apparent. It also has an array of mission symbols. Ian Black



▲ This Tornado GR.Mk 1A was recovering into Dhahran after a combat sortie. The big jugs were 'borrowed' from the F3 fleet and often retained their light grey fighter colours. RAF (AHB)/© UK MoD Crown Copyright 2016

Locusta Tornados

Under the code name Operation Locusta, the Aeronautica Militare Italiana (Italian Air Force) sent an initial eight Tornado IDS to Al Dhafra, Abu Dhabi on October 2, 1990. Two more subsequently arrived and, armed with Mk 83 bombs, eight aircraft launched for their first combat sortie on the night of January 17/18, 1991.

One jet turned back with a technical malfunction, while the crews of the remaining seven were unfamiliar with the techniques and procedures for refuelling from the hose-equipped KC-135; only one Tornado was able to take fuel and continue with the mission, and it was shot down.

The Italians subsequently used buddy refuelling, with some Tornados equipped as tankers. In this way they went on to deliver 565 Mk 83s in almost 230 sorties.



▲ Squadron Leaders Ivor Walker and Bobby Anderson ejected from ZA466/FH on October 18, 1990, leaving the aircraft to crash onto the runway. They had been approaching to land when the main undercarriage clipped the incorrectly raised emergency arrester barrier. RAF (AHB)/© UK MoD Crown Copyright 2016

PILOT PERSPECTIVE

Ian Black flew the Tornado F3 during Operation Granby, having previously flown the English Electric Lightning. He looks back over 25 years, at the aircraft and what it was like to fly in the Gulf

August 1990 saw the RAF accepting its latest interceptor in rapid order – while it would have been logical to replace the less capable Lightning first, the bulk of the Tornado squadrons had initially replaced the Phantom FGR2, then the Lightning and finally the tired FG1 Phantoms. With RAF Coningsby firmly home to the Tornado F3, RAF Leeming, further to the north, was also up to its full strength of three squadrons and the drawdown of the Phantom at RAF Leuchars was in full swing; there would be seven frontline F3 squadrons.

There seemed no urgency to rectify a host of operational problems with the Tornado. The Cold War was thawing rapidly and as a fighter it was adequate in the role of UK QRA. Compared to the Tornado GR1, Jaguar or Buccaneer however, it was the least capable of actually going to war.

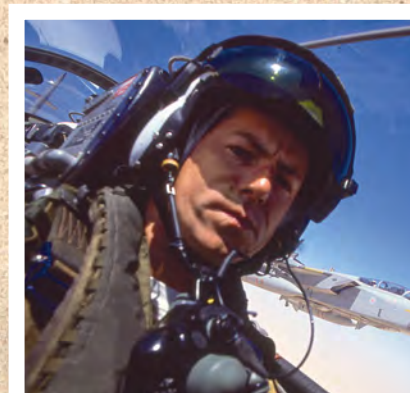
When the conflict in Kuwait began, the rapid deployment of aircraft and crews from 5 and 29 Squadrons only served to highlight the aircraft's deficiencies – it was simply not fit for war without rapid and urgent modifications. Quick decisions were needed to enable the RAF to deploy a credible air defence force as well as give confidence to the RSAF, which operated the F3 and GR1.

It was subsequently decided to form a combined force from the three squadrons at RAF Leeming, under the guise of 11 (Fighter) Squadron. Aircraft were pooled and the most capable airframes switched from the Leuchars wing and delivered to Leeming for modification. These included radar improvements, engine performance upgrades, the controversial application of radar absorbent paint and the highly classified addition of radar absorbent tiles in the intakes. A crucial addition was the secure US Have Quick radio – without this the RAF would not have been able to participate in the Coalition.

While crews had little time to get up to speed with what the Iraqi Air Force might be capable of, the engineers worked around the clock to prepare the aircraft for the long ferry flight and the possibility of an extended stay in the Gulf.

Within a matter of weeks the F3 had been transformed from a below par interceptor into a credible fighter. Vital upgrades, including decoy flares, chaff dispensers and compatibility with improved AIM-9M Sidewinders were all installed in a transition to war that would have taken years in peacetime – the Gulf conflict was the F3's savior.

Once in theatre, the Leeming Wing



Ian Black during Operation Granby.
Ian Black

took over from the Coningsby Wing and began continuous CAP missions. Each lasted four or more hours and involved between two and four aircraft, with tanker support. Crews quickly found that flying in a full war fit of four AIM-9Ms, four Sky Flash, a loaded gun and two of the large 2,250-litre tanks in temperatures of 40°C+ was very different to operating with the normal 'clean' fit flown in the UK.

By December the Leeming Wing had developed operational procedures for the force and it was left to crews from 43 and 29 Sqns to actually take part in the conflict. Now fully integrated into the combined force, the Tornado F3 didn't fire a shot in anger, but established the framework for what became one of the RAF's most capable interceptors.



An RSAF ADV sits fully armed, awaiting its next mission. The white covers on the canopy and windscreen protected the cockpit from the searing desert heat. DoD

BUCCANEER

Designed as a low-level maritime strike aircraft, the Buccaneer saw combat in the last throes of its career, at medium level over the Iraqi desert



Early on in the type's Desert Storm appearance, 208 Sqn groundcrew were preparing this Bucc for a sortie in the initial fit. This included an AIM-9L AAM on the outboard port pylon, with Pavé Spike inboard. An ALQ-101 ECM pod balanced the Sidewinder, with a fuel tank on the inner starboard hardpoint. RAF (AHB)/© UK MoD Crown Copyright 2016



Taking off for a later mission, this jet has dispensed with the Sidewinder and fuel tank in favour of a pair of LGBs. The Buccaneer's capacious fuselage bomb bay housed auxiliary fuel for Desert Storm, reducing its reliance on tankers. RAF (AHB)/© UK MoD Crown Copyright 2016

Similar to the F-4, KC-135 and Victor, the Blackburn Buccaneer was the result of 1950s' technology, but nonetheless performed a war-winning mission. Latterly employed in an anti-shipping role, the RAF's Buccaneer fleet had been equipped with the AN/AVQ-23E Pavé Spike laser-designation pod, based on technology first employed by USAF Phantoms in the early 1970s.

The low-level Cold War tactics for which the RAF's Tornado crews had trained quickly and dramatically proved inadequate for Desert Storm, the jets falling easy prey to the dense defences arranged around airfields. Switching to medium altitudes left the Tornado lacking on bombing accuracy and although the CPU-123/B, a British 1,000lb warhead fitted with the Paveway II kit, was available, the Tornado had no means of aerial designation.

Eventually two TIALD pods and five compatible aircraft were made available, but Tornado laser bombing initially relied solely on the Buccaneer and Pavé Spike. Such was the urgency of the requirement that the old jets were modified and their crews prepared for deployment from RAF Lossiemouth in just ten days.

A period of intense training with the Tornado crews at Muharraq followed, since the latter had no LGB experience. A standard formation of one Buccaneer with two Tornados was devised and the first mission followed on February 2, successfully dropping the As Samawah road bridge over the Euphrates.

Similar attacks against bridges and subsequently airfields followed, with a generally high degree of success,



'Pirate' flags made an appearance on many Buccaneers, while all took the names of Scotch whiskies distilled in the area around their RAF Lossiemouth home base. RAF (AHB)/© UK MoD Crown Copyright 2016

although when issues arose, they had dire consequences. On February 13, three weapons failed to guide – perhaps because of smoke – and one fell into a market place in Fallujah. Then, during an attempt to use four 'Buccs' and eight Tornados against Al Taqaddum the next day, the final Tornado to attack was downed by SA-2s while its crew were distracted by the bombing sequence.

From February 21 the Buccs abandoned the self-defence Sidewinders that had been their standard fit, instead taking their own LGBs into battle. Having 'lased' for the Tornados, the Bucc crews then self designated for their own bombs and in this way destroyed two Antonov An-12 *Cub* transports on the ground.

The Buccaneers returned to their Lossiemouth base triumphant, having flown 216 sorties for 678.5 hours. ❖

BLACKBURN BUCCANEER S.2B

- **Powerplant:** two Rolls-Royce RB168 Spey Mk 101 turbofans each rated at 11,200lb (49.81kN) thrust
- **Performance:** maximum level speed at sea level 560kt (1,038km/h), tactical radius 'clean' on a hi-lo-hi sortie 521nm (966km)
- **Dimensions:** wing span 44ft (13.41m), length 63ft 5in (19.33m), height 16ft 3in (4.95m), wing area 515sqft (47.85m²)
- **Weights:** empty 29,980lb (13,599kg), loaded 62,000lb (28,123kg), maximum stores load 16,000lb (7,257kg)



US AIR FORCE

The US Air Force inevitably took the lead role in the air war that defined Operation Desert Storm. It dominated the airlift effort that sustained the war, fielded vital reconnaissance assets, downed more enemy aircraft than the other Coalition air arms combined and bore the brunt of the bombing

Unquestionably the world's most powerful air arm, the US Air Force was organised into a Cold War structure that had suited America's superpower posture well, but proved somewhat unwieldy when applied to the new demands of Desert Shield and, ultimately, Desert Storm. It comprised major commands, air forces and the Air Force Reserve (AFRes) and Air National Guard (ANG), the latter two contributing personnel and aircraft to the frontline as required.

Strategic Air Command (SAC) and Tactical Air Command (TAC) were of prime importance, the former predictably responsible for the US strategic bomber force, but also taking charge of strategic assets required for its operation. Thus, most of the USAF's huge tanker fleet belonged to SAC, while the majority of USAF receivers during Desert Shield and Storm were from TAC. The strategic reconnaissance fleet of Lockheed U-2/TR-1 'spyplanes' and RC-135 Rivet Joints also flew under SAC command, which easily caused delays in time-sensitive

intelligence reaching the tactical units that may have been able to use it.

Most of the tactical aircraft, the 'fighters', belonged to TAC, which also flew the E-3 AWACS (Airborne Warning And Control System), a key enabler in any air war regardless of command. Tactical air power was also vested in Pacific Air Forces (PAF) and US Air Forces Europe (USAFE), this mass of combat capability being brought together at bases across the Gulf region and in Turkey to fight within a Coalition, effectively as one co-ordinated air force.

Airlift

While squadrons established themselves at new bases for Desert Shield, a massive airlift – the largest ever seen – delivered a constant stream of equipment, people and supplies into theatre. Strategic transports – the Lockheed C-5 Galaxy and C-141 StarLifter – typically moved large loads into major bases, from where C-130 Hercules fanned out across the region like spokes from a hub, distributing personnel and materiel far and wide.

Military Airlift Command (MAC) committed seven Military Airlift Wings (MAWs) to the regular C-5 and C-141 support campaign, at the same time forward basing elements of five C-130 wings in the region. It also maintained five detachments of C-21A (Learjet 35) transports in theatre for high-speed personnel and logistics transport.

Three ANG and five AFRes units moved C-130s into the Gulf, while 13 units from the former and nine from the latter flew the Hercules on arduous return journeys between the Middle East and the US. The AFRes also contributed four C-5 and five C-141 units, and the ANG another of C-5s.

Although the ANG and AFRes KC-135 Stratotanker units were massively committed to both the airlift and combat aircraft deployments, the major part of the KC-135 and KC-10 Extender fleets resided with SAC. It too 'towed' tactical aircraft into the region, but also found itself working alongside MAC, especially given the considerable cargo capacity of the KC-10.



◀ With Kuwait's burning oilfields as a backdrop, this photograph sums up the cutting edge of TAC air power in 1991. A pair of F-16s sits on the outside of the formation, with two 'dark grey' F-15E Strike Eagles and a single 'light grey' F-15C inside. DoD



As well as refuelling deploying fighters and supporting strike packages, the KC-10 hauled large cargo loads between the US and the Middle East.
Senior Airman Rodney Kerns/USAF

Many senior personnel within the USAF's leadership had been keen to retire the A-10, but its combat debut in Desert Storm scuppered those plans.
Senior Airman Chris Putnam/USAF



U-2 OPERATIONS: DEFINING THE BATTLEFIELD

The contribution made by the high-flying U-2R and TR-1A to the success of Desert Storm is easily overlooked. Paul F Crickmore examines the operations of these uniquely USAF assets

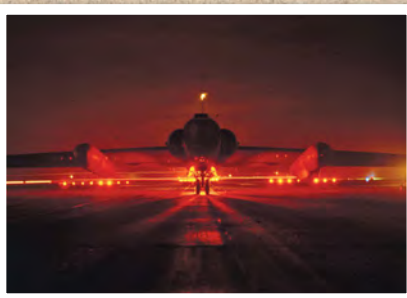
The extreme value of reconnaissance to Desert Storm is impossible to overstate and before any attempt could be made to liberate Kuwait, Coalition commanders required a wealth of intelligence about the strength and disposition of Iraqi forces.

As part of this intelligence-gathering effort, U-2Rs from the 9th Strategic Reconnaissance Wing (SRW) at Beale AFB, California and TR-1As of the 17th RW, RAF Alconbury, Cambridgeshire, deployed to Taif AB in Saudi Arabia from August 17, 1990.

There they formed the 1704th Reconnaissance Squadron (Provisional). In support, a compound within the US Training Mission at Riyadh served as home for an operations centre and various pieces of special ground equipment for the U-2's onboard reconnaissance systems.

By the end of November there were five U-2s/TR-1s at Taif. Two U-2Rs equipped with the Senior Year Electro-Optical System (SYERS) and two TR-1As with the Advanced Synthetic Aperture Radar System (ASARS), were capable of providing real-time imagery of Iraqi forces occupying Kuwait. The fifth aircraft, a U-2R, was a Senior Span aircraft, configured to collect signals intelligence (SIGINT), again in real-time, and download it to terminals at Riyadh.

The Desert Shield operational cycle



A TR-1 of the 17th RW awaits take-off clearance for an early morning sortie.

Paul F Crickmore Collection

usually consisted of flying a SYERS mission every day, an ASARS mission every night, and a Span mission every second day. Most of these missions lasted eight hours, although some extended to 11. Their tracks were positioned no closer than 15 miles (24km) to the Iraqi border and a MiG combat air patrol (MiG CAP), provided by F-15s, ensured that these national security assets remained safe from Iraqi attack. From their operational altitude of 70,000ft, the SYERS and ASARS sensors could image most of southern Iraq, while the SIGINT sensors on the Span platform covered most of the country, including Baghdad.

In early January, a 15-van Mobile Intelligence Processing Element (MIPE)

was reactivated at Beale and airlifted to Riyadh. Working with 9th SRW U-2Rs equipped with IRIS III and H-cameras, it allowed the Central Command (CENTCOM) leaders planning the air war access to much-needed hard copy photographs.

Scud hunting

Shortly after the beginning of Desert Storm the 1704th RS(P)'s aircraft complement increased to 12 and the first cross-border U-2 missions began in order to image fixed Scud missile sites. An estimated 15 sites were identified from U-2/TR-1 imagery and eliminated during the first week of war.

Despite the U-2's vulnerability to surface-to-air missiles and the fact that its radar warning and jamming systems had not been updated for many years, some missions were flown specifically to pinpoint SAM sites. Towards the end of the war U-2 pilots also became 'high altitude FACs', identifying Iraqi troop and tank concentrations and relaying their co-ordinates to Coalition artillery commanders.

One USAF general stated of U-2 imagery that: "80% of targets produced by ASARS were at the stated co-ordinates when strike assets arrived on station, and 70% of these targets resulted in secondary explosions."



As a 9th SRW Senior Span U-2R launches, the 17ft (5.18m) long radome on top of its fuselage is readily apparent. It housed a 30in (762mm) parabolic antenna for the aircraft's satcom link. USAF



A SYERS-configured U-2R imaged these burning Kuwaiti oilfields. USAF



A U-2R equipped with an HR-329 Type-H camera photographed this Iraqi airfield from 70,000ft. The gyro-stabilised camera had a focal length of 66in (1,676mm). USAF

This annotated ASARS-2 image was taken by a TR-1A during Desert Storm. The digitised imagery was transmitted in near real-time to ground commanders, giving them access to an unprecedented overview of the five-day ground battle.





The tankers were perhaps the greatest enablers of Desert Storm and most of them belonged to the USAF. Here a KC-135R extends the time on CAP for an F-15C. CMSgt Don Sutherland/USAF



Lockheed C-141 StarLifters and two examples of the much larger C-5 Galaxy await loading in the US before the long haul to Saudi Arabia. DoD



There were no finer exponents of the laser-guided bomb than the F-111Fs of the UK-based 48th Tactical Fighter Wing.
TSgt Rose S Reynolds

Combat power

Strategic Air Command took an important offensive role with the conventionally-armed B-52G Stratofortress, operating the type out of several bases to pound Iraqi installations and troop positions.

The A-10s, F-15Es and F-16s that TAC brought to the war bore the brunt of USAF combat however, employing mostly unguided weapons, but in the case of the F-15E, increasingly proving the devastating efficiency of precision-guided munitions. TAC also flew electronic warfare missions with its EC-130H and EF-111A jammers, and AFRes A-10s and ANG F-16s bolstered its air power.

More tactical warplanes – A-10s, F-4Gs, F-16s and F-111s – came from

USAFE, some of them for bases in Turkey. While the F-4G was a dedicated Wild Weasel defence suppression aircraft, USAFE also contributed the RF-4C tactical reconnaissance aircraft, which flew alongside ANG machines. They offered a unique capability within the air force, primarily delivering photographic intelligence whose only other source was the SAC U-2R/TR-1A.

Finally, air defence rested entirely on the shoulders of the F-15C community, comprising units drawn from TAC and USAFE. Much was expected of the Eagles, but the Iraqi Air Force was thought to command considerable respect and it would have been a foolish pilot that expected an easy ride. The ride

was not easy, but the foolish pilot would not have been entirely wrong.

Given the power and diversity of its fleet, the US Air Force dominated the war, even beyond the imaginings of its senior leadership. But lessons were learned and in the months following Desert Storm a new organisational structure was introduced.

Considerable emphasis was also placed on precision-guided munitions, which quickly became the norm rather than the exception they had been over Kuwait and Iraq.

The USAF lost 13 aircraft in combat, six to pre-war mishaps, two in accidents during Desert Storm and two immediately after the ceasefire. ❖



Given the size and complexity of the Desert Storm operation, its execution would have been unthinkable without the USAF's E-3 AWACS and US Navy's E-2 Hawkeye. *DoD*



The 'TJ' tailcode identifies this F-16C as a USAF aircraft home based at Torrejón AB, Spain. *SSgt Lee F Corkran/USAF*

Operation Proven Force

Around 120 USAF aircraft, the majority of them from USAF units, were based in Turkey under Operation Proven Force. Formed into the 7440th Composite Wing, they enabled a 'second front' to be opened against northern Iraq.

Targets beyond the range of aircraft based in Saudi Arabia were struck and the presence of 7440th CW warplanes, which typically mounted two day time and one nocturnal attack in every 24-hour period, prevented Iraqi forces seeking shelter to the north. The wing was largely self supporting, with organic Wild Weasel, tactical reconnaissance, AWACS, EW, air defence and combat search and rescue (CSAR) capability.

Its MH-53J Pave Low CSAR helicopters and HC-130P/N Hercules were not required in their primary role, instead supporting special forces deployments into northern Iraq. The wing's Eagles shot down two Dassault Mirage F1s, a MiG-23 *Flogger* and two helicopters, losing only one F-16, which crashed on approach after an engine failure.



Much of the USAF's equipment was aging and maintenance could be a challenge, especially under the pace of combat. These engineers were working on a B-52G engine during Desert Shield. *CMSgt Don Sutherland/USAF*



▲ Several types faded from service soon after Desert Storm, as the USAF restructured and the 'peace dividend' that followed the imminent collapse of the Soviet Union bore fruit. The veteran Sikorsky HH-3E CSAR helicopter was among them, having made its contribution to Desert Storm with the 71st Special Operations Squadron, AFRes.

Wikimedia Commons

◀ The mission symbols along their cockpit sills show that these F-117s have returned from their Desert Storm service. The war marked the operational debut of 'stealth' as applied to an entire airframe, and proved its deadly efficiency. *DoD*

▼ The ANG added greatly to the airlift effort both into theatre and within. This Texas ANG C-130 was loading equipment for onward movement during Desert Shield. *TSgt Perry Heimer/USAF*



A handful of two-seat F-15D Eagles made it into theatre, including this one, being flown on a Desert Shield mission by the 1st TFW's Lt Col George Wagasky. *CMSgt Don Sutherland/USAF*



Desert Storm really was the twilight of the Phantom's career in US service. The F-4G Wild Weasel delivered an exceptional performance, its presence soon proving enough to keep Iraqi air defence radar operators off the air. *TSgt Deffner/USAF*

IRAQ: POTENTIAL DENIED

Combat proven and relatively well equipped, Iraq's air force was hamstrung by its leadership. Many aircraft fled to Iran to avoid relentless Coalition attacks, as Thomas Newdick explains

An Iraqi MiG-29 before the war.
USAF F-15Cs shot down six
Fulcrums in aerial combat.

Ali Tobchi via Doug Dildy



Established in 1931, the Iraqi Air Force (IrAF) was a relatively powerful, combat-proven air arm in August 1990, when Saddam Hussein launched his ill-fated invasion of Kuwait. The IrAF had gained valuable experience during successive Arab-Israeli air wars (in 1948, 1967 and 1973) and during the bitter Iran-Iraq War of 1980-88.

It was the campaign fought against Tehran that spurred the expansion of the IrAF from a total of just over 300 aircraft in 1980 to a formidable 997 by January 1991, including more than 491 modern fixed-wing combat aircraft. The Iraqi Army fielded 230 helicopters.

When Iraqi forces entered Kuwait on August 2, 1990, the Iraqi Army employed its BO 105, Mi-8/17 *Hip*, Mi-25 *Hind* and Bell 412 helicopters, delivering commandos into the capital, Kuwait City. The IrAF was late in delivering air support with its Mirage F1s, MiG-23BN *Floggers*, Su-22 *Fitters* and Su-25 *Frogfoots*, however. As a result, Iraqi special forces suffered numerous casualties and several helicopters were destroyed.

By the time the IrAF had made an appearance, the Kuwaiti Air Force had moved out to forward operating locations and managed multiple strikes before evacuating its aircraft to Saudi Arabia.

Despite its strength in numbers, the Iraqi Air Force was suffering from a number of shortcomings on November

29, 1990, when the UN Security Council approved Resolution 678, which ordered Iraqi forces to withdraw from Kuwait by January 15, 1991.

Air Force personnel had been purged several times in the wake of the Iran-Iraq War, while training sorties had been slashed in the course of 1990 and many aircraft were suffering the effects of long years of combat use. Some types, including the Tupolev Tu-22 bomber, had been withdrawn.

Fulcrum

At the outbreak of war the IrAF had 29 operational MiG-29s, based at Al Asad and Al Taqaddum, while two two-aircraft detachments stood quick reaction alert duty at Mudaysis and Jalibah, in southern and southwestern Iraq.

A *Fulcrum* succeeded in damaging a

B-52G over Mudaysis, another claimed to have inflicted damage on an F-111F and one claimed to have destroyed an RAF Tornado on January 19. While the USAF claimed as many as eight MiG-29s shot down, the IrAF lost only six in aerial combat. In addition, seven MiG-29s were destroyed on the ground and four were evacuated to Iran.

Foxbat

The Iraqi MiG-25 *Foxbat* performed comparatively well in the fighting, with only two lost during several engagements with the highly successful USAF F-15C. In an incident on January 30, a MiG-25 launched a radar-guided R-40R missile at one of the US fighters and erroneously claimed a hit.

A MiG-25PDS shot down a US Navy F/A-18C operating from USS *Saratoga*.

MiG-23BN serial number 23173.

Albert Grandolini Collection via Doug Dildy



Coalition troops found this abandoned Iraqi Army Mi-24 after the war. SSgt Dean Wagner/DoD



Iraq's hardened aircraft shelters offered little protection from Coalition LGBs. This Su-22 was destroyed inside its HAS. Sgt Kimberly Yearyear/DoD

The *Foxbat* pilot approached the Navy strike package in the face of heavy jamming and at a speed in excess of Mach 1. The Iraf recorded only a probable kill until the Hornet's wreckage was later found in the desert.

The *Foxbat* force comprised 19 MiG-25PD/PDS interceptors and nine MiG-25R/RBT reconnaissance-bombers, stationed at Al Asad and Al Taqaddum. The base was a priority Coalition target and on the first night of the war mines from an RAF JP233 dispenser damaged a taxiing MiG-25, injuring the pilot.

In addition to the two MiG-25s downed in combat with Eagles, 14 aircraft were destroyed on the ground, with another four written off.

Flogger

In the early hours of January 17, MiG-23ML interceptors twice attempted to engage USAF F-111F interdictors, but were foiled on each occasion by jamming and no missiles were launched. When the MiGs did manage to get missiles away, it was against BQM-74 decoy drones, both of which were destroyed.

The Iraf began the war with 63 'Flogger' fighters – MiG-23ML, MF and MS variants – in addition to 38 MiG-23BN fighter-bombers. Iraqi records show that 18 MiG-23MF/MS/MLs and 17 MiG-23BNs were lost. Of these, as many as five MiG-23MLs and three MiG-23BNs were shot down by F-15Cs. Seven MiG-23MLs and three MiG-23BNs were successfully evacuated to Iran, while another crashed en route.

Mirage

When Operation Desert Storm began on January 17, Coalition forces concentrated on disrupting Iraf capabilities by targeting its command and control facilities. A number of Iraf interceptors therefore managed to get airborne in the early hours, including a Mirage F1EQ that engaged a USAF EF-111A. The Raven crew subsequently claimed, erroneously, that they had achieved a manoeuvre kill against the Iraqi jet.

The Iraf was in the process of receiving its final Mirage F1s when a UN arms embargo came into effect in August 1990. It left the Air Force with 29 serviceable Mirage F1s of different 'early' variants – F1EQ, EQ-2, EQ-4 – and 34 of the advanced Mirage F1EQ-5 and EQ-6, with a much more powerful anti-shiping capability.

Among their multiple roles, the Mirages flew intelligence gathering missions in the run-up to Desert Storm, using the Syrel ELINT pod to develop an electronic order of battle during flights along the Saudi border. After combat had been joined, 23 Mirages escaped to Iran, but six early-model aircraft were shot down.

Fitter and Fencer

The Su-22 force also suffered heavily under Coalition air raids, which destroyed at least 24 aircraft. A little more fortunate were the 36 *Fitters* that attempted to flee to airfields in Iran, although three of these were shot down during their escape and another pair lost to fuel starvation en route.

Iraq's 30-strong squadron of Su-24

Fencer strike aircraft fared better on the ground, but was unable to launch a planned strike against Israeli nuclear facilities. Highly prized, the *Fencers* were earmarked for early evacuation to Iran, during the course of which one was reportedly pursued by a pair of F-15Cs. The crew claimed to have used their radar countermeasures to defeat three AIM-7Ms before decoying no fewer than four AIM-9s using a volley of infrared flares.

Frogfoot

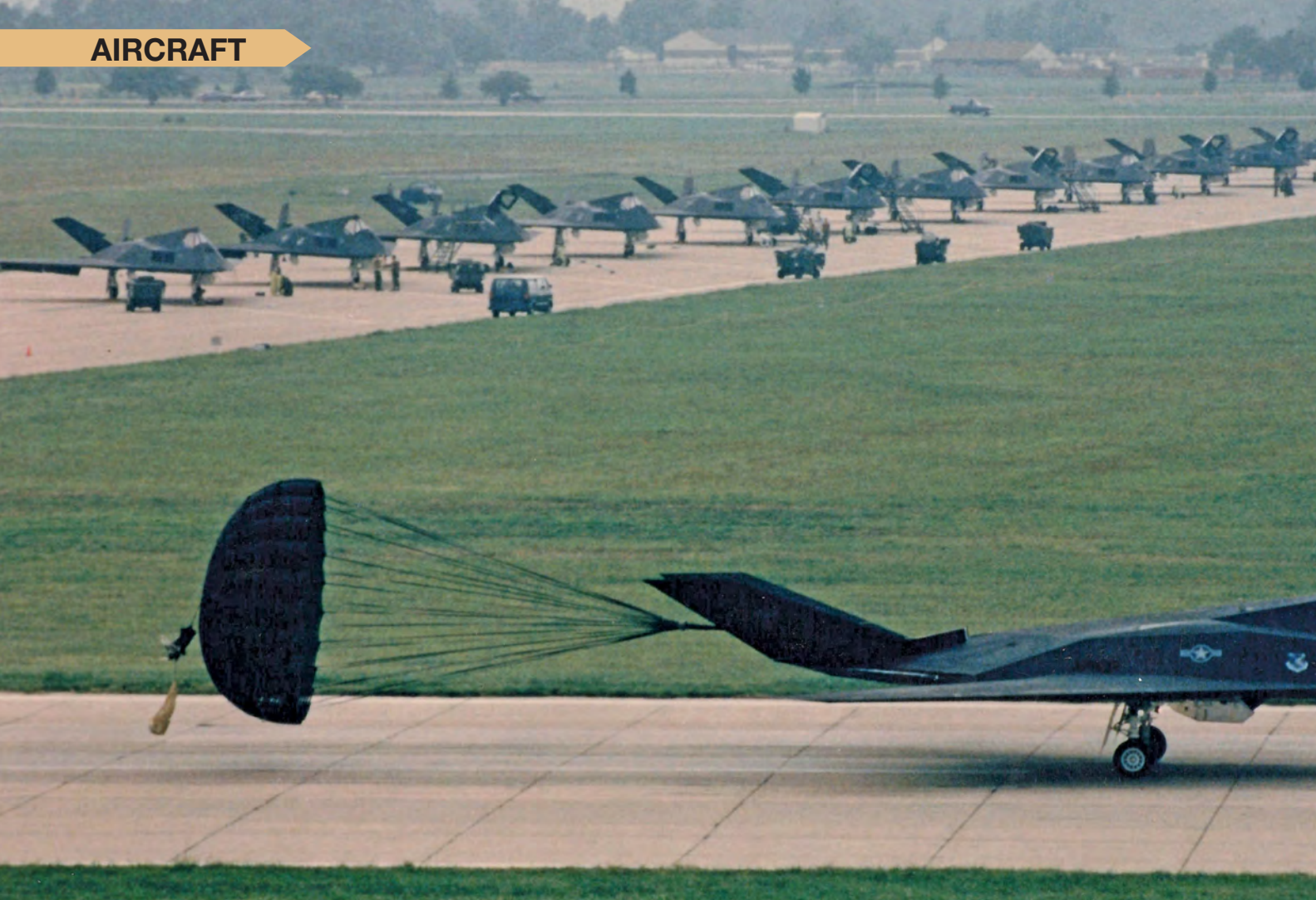
The Iraqi Su-25 ground-attack aircraft, deliveries of which had begun in late 1985, suffered four losses in aerial combat and at least 27 were destroyed on the ground, plus another eight written off, while seven aircraft escaped to Iran.

When the ceasefire was declared on February 28, the Iraf admitted to losses of 23 pilots in aerial combat, compared to a figure of 44 aerial victories claimed by the US, which includes six army helicopters and two unverified kills. It should be noted that the Iraf acknowledged a loss in aerial combat only when the pilot was killed. It also did not recognise aircraft shot down during the evacuation to Iran, since this was not considered aerial combat, leading to a considerable discrepancy between its records and those of the US.

Official Iraf data shows that 115 combat aircraft attempted to flee to Iran (not including 22 transports and 11 airliners) and that 113 arrived safely. Additionally, 117 aircraft were destroyed in their HASs and another 113 were so badly damaged that they were written off. ❖



Iraqi Air Force MiG-23ML 23255 was photographed in Russia. Ali Tobchi via Doug Dildy



F-117 NIGHTHAWK

Desert Storm saw the debut not only of Lockheed's F-117 Nighthawk, but of stealth technology. Combining this with the aircraft's precision targeting system delivered superlative results, as Paul F. Crickmore explains

Ten days after Iraq invaded Kuwait, on Friday August 17, 1990, Colonel Al Whitley took over command of the 37th TFW from Col Tony Tolin. Based at the Tonopah Test Range (TTR), the 37th included the 415th TFS 'Night Stalkers', 416th TFS 'Ghost Riders' and 417th Tactical Fighter Training Squadron (TFTS) 'Bandits'. Whitley immediately received orders instructing him to deploy the 415th to Saudi Arabia on Sunday.

Twenty-two 'black jets' touched down at Langley AFB, Virginia on August 19, for a one-night stop-over en route to King Khalid AB, Saudi Arabia. With four aircraft designated as spares, 18 F-117s and their tankers were airborne again next day, completing the non-stop haul to Saudi Arabia in 15 hours.

King Khalid was a state-of-the-art airfield, located well beyond Iraqi *Scud-B* missile range. This geographical separation meant that if the Nighthawks were called upon to strike Baghdad they would three air refuellings (ARs) per sortie,

with a typical mission length of five hours.

On September 5, General Buster Glosson, commander of the 14th Air Division (Provisional) and director of campaign plans for US Central Command Air Forces, Riyadh, presented the air campaign plan to Coalition commander General Schwarzkopf – it was enthusiastically received and approved.

Iraqi Air Defence

Meanwhile, USAF aircraft acting as 'ferrets' were flying up to Iraqi border areas to stimulate the air defences, enabling communications intelligence (COMINT) and electronic intelligence (ELINT) assets to map Iraq's electronic air order of battle (EAOB).

The country's integrated air defence system (IADS) was extremely sophisticated, such that its destruction would chronically disable Iraq's tight central control system. It included 73 radar-reporting stations supplemented by 400 visual observation posts, feeding into

17 intercept operations centres (IOCs). The IOCs were controlled by four sector operations centres (SOCs) which also passed the 'air picture' in their sector to the Air Defence Operations Centre (ADOC) in Baghdad. From this three-storey, reinforced concrete bunker the defence of enormous areas of Iraq could be co-ordinated.

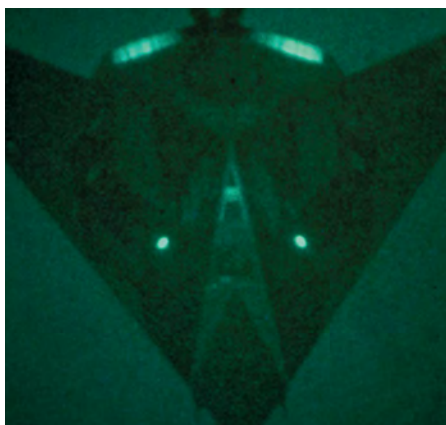
The destruction of enemy air defence command and control capabilities was therefore a top priority on the way to establishing air superiority, a prerequisite for any subsequent land battle, and Glosson's attack plan was designed accordingly:

- Destroy/disrupt C2 nodes
- Disrupt EW/GCI coverage and communication
- Force air defence assets into autonomous operating modes
- Use expendable drones for deception
- Employ maximum available HARM shooters



LOCKHEED F-117A NIGHTHAWK

- **Powerplant:** two General Electric F404-GE-F1D2 turbofans each rated at 9,040lb (40.20kN) installed thrust
- **Performance:** maximum speed high subsonic
- **Dimensions:** wing span 43ft 4in (13.21m), length 63ft 9in (19.43m), height 12ft 5in (3.78m) to top of canopy, wing area 912.7sqft (84.79m²)
- **Weights:** empty 29,500lb (13,380kg), maximum take-off 52,500lb (23,813kg), weapon load 5,000lb (2,268kg)



Night time refuelling from a KC-135.

All USAF via Paul F Crickmore

The Nighthawks arrived at Langley AFB, Virginia on August 19, 1990. The next morning, 18 of them continued on to Saudi Arabia as they deployed for Operation Desert Shield.

The plan tasked the F-117s against the ADOC, SOCs and IOCs at the outset, as well as key early warning radars and communication links. The remainder of the decapitated air defence network could be left to non-stealthy assets.

Successfully executed, the plan would have two primary benefits. Without the IADS, SAM batteries would be forced to use their radars for extended periods, increasing their vulnerability to attack from anti-radiation missiles. It would also cut communications between Iraqi ground controlled intercept (GCI) operators and fighter pilots, leaving the latter easy prey for Coalition fighters.

As the weeks ticked by, it was decided that the 416th 'Ghost Riders' should also be deployed. On December 4, all 20 of its aircraft arrived at King Khalid.

Since the Nighthawks had no self-defence systems, lacked a radar homing and warning system (RHAWs) display and would be attacking from medium altitude (between 12,000 and 18,000ft), their pilots and the military planners were eager to check on the effectiveness of the F-117's stealth technology.

Therefore, as Desert Shield neared its conclusion, two F-117 pilots flew their aircraft towards the Iraqi border while an RC-135 Rivet Joint monitored Iraqi reaction. There was none until the AR

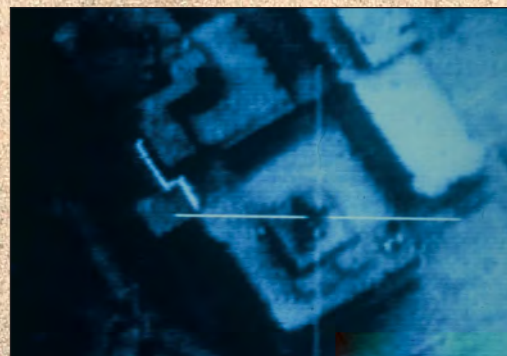
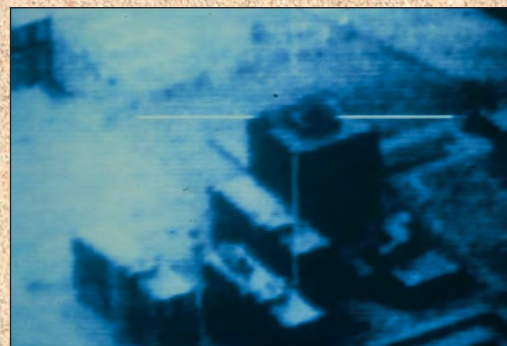
tankers were instructed to also fly towards the border – the Iraqis saw the tankers on their radars and immediately went into a high state of alert. The possibilities for stealth technology were promising.

The 37th TFW received the order to implement Operation Desert Storm on the morning of January 16, 1991. The first attack was to be delivered at 03:00hrs Baghdad time on the 17th and at 00:22hrs the first of three waves of F-117s climbed out of King Khalid AB.

Over the 43 nights that followed, 41 F-117s flew 1,247 sorties in 6,905 flight hours, working the most highly defended targets in Iraq and achieving bombing results never before recorded; without damage to a single aircraft.

At the war's conclusion, Gen Buster Glosson noted, "Reflecting on the Gulf War, and specifically the F-117 and what it was able to accomplish, only one word seems appropriate. Awesome..."

Leading the first element of eight F-117As to return home from King Khalid, Col Al Whitley and two KC-10s, carrying 130 support personnel, touched down at Nellis AFB in front of a crowd of 25,000 on April 1, 1991. Over subsequent months all but a handful of the 37th's jets returned home, but those that remained in Saudi Arabia constituted the backbone of Operation Southern Watch. ❖



▲ Captain Mark Lindstoem was tasked against the new Iraqi Air Force HQ building. These frame grabs from the video camera within his F-117's Infrared Acquisition and Designation System (IRADS) show precisely what Lindstoem saw as he controlled an LGB onto the target. Perfect tracking culminates in smoke billowing from all four sides of the building as the weapon explodes inside.



Colonel Al Whitley was the first operational USAF pilot checked-out in the F-117, on October 15, 1982. He led the 37th TFW (Provisional) throughout Desert Shield/Storm and is pictured here on his return to Nellis.

F-15 EAGLE AND STRIKE EAGLE



During Desert Shield the 36th TFW deployed a squadron of F-15Cs from their base at Bitburg, West Germany. According to USAF records they were responsible for destroying a Mirage F1EQ, two MiG-21 *Fishbeds*, three MiG-23s, two Su-22s and two Su-25s in aerial combat, plus a Pilatus PC-9, whose pilot ejected, leaving the aircraft to crash. *TSgt Fernando Serna/DoD*

Among the first Coalition assets in theatre, the USAF's F-15 Eagles reigned supreme in air-to-air combat, while the F-15E received its combat debut, as Steve Davies describes

Operation Desert Shield began with the deployment of F-15Cs and F-15Es to the Persian Gulf region as the first tactical Coalition air assets to arrive in theatre. The 1st FW at Langley AFB sent 24 F-15C and three F-15D aircraft to Dhahran AB on August 7; next day, 25 F-15C/Ds arrived from the 27th TFS. The Eagles immediately began flying combat air patrols to protect Saudi Arabia's sovereign airspace.

On August 9, the 336th TFS 'Rocketeers's' F-15Es arrived at Thumrait AB, Oman, via Dhahran. At this time the Strike Eagle was so new that it was cleared to release only 2,000lb Mk 84 and 500lb Mk 82 Low Drag General Purpose (LDGP) bombs, making it little more than a very sophisticated dumb bomb truck.

Nonetheless, the Strike Eagles were the Coalition's only real in-theatre strike capability at this critical time, representing a credible capability that could slow (but, it was accepted, not halt) an Iraqi ground assault into Saudi. In fact, the threat of further Iraqi advances passed and the Rocketeers and 33rd TFS 'Chiefs' (which had by now joined the 336th) moved to Al Kharj AB, Saudi Arabia, in December.

US Air Forces Europe's growing commitment to the build up also continued, and the 53rd TFS, 36th TFW sent 24 Multi-Stage Improvement Program (MSIP) II F-15Cs from Bitburg AB, Germany, to Prince Sultan AB, Saudi Arabia, on 20 December.

Meanwhile, the 525th TFS deployed to Incirlik AB, Turkey, to patrol Iraq's northern territories. Additional F-15Cs from the 32nd TFS, Soesterberg AB, Netherlands, later joined the 525th TFS in Turkey, arriving on the first day of the war – January 17, 1991.

Planning the air war

In Riyadh, Saudi Arabia, Coalition and US personnel had formed the Tactical Air Control Center (TACC) to plan the air war. It published the 600-page Air Tasking Order (ATO) – the route map for the air campaign against Iraq, which in its final iteration detailed every sortie that was to be flown for the first three days of the air war. Daily updates were published for each day that followed.

The ATO tasked F-15Es primarily against SAM sites and key airfield complexes, but they were also assigned

to the *Scud*-hunting mission. On January 16, 1991, President Bush gave the order for the first strikes – Operation Desert Storm began the next day. With the world's media filming what seemed like every minute, waves of Coalition strikers took off to attack the 'eyes and ears' of the Iraqi military machine.

Iraq's IADS was the primary target for many of the first sorties so that air superiority could be attained, with airfields also attacked. The ATO called for subsequent strikes against Iraqi armour; command, control and communications (C3) assets; and logistics targets, paving the way for a less protracted and, hopefully, less bloody ground war to rid Kuwait of its uninvited Iraqi guests.

Five fixed *Scud* sites in western Iraq were hit by 24 F-15Es that night. Divided into three- and four-ship packages, each of the jets carried two fuel tanks, 12 Mk 20 Rockeye cluster bombs (the weapon had been hastily cleared for release by the Strike Eagle) and two AIM-9M missiles. One flight attacked *Scud* sites at H-2, with each of its jets hauling 12 Mk 82s.



MCDONNELL DOUGLAS F-15C EAGLE

- **Powerplant:** two Pratt & Whitney F100-PW-220 turbofans each rated at 23,450lb (104.30kN) afterburning thrust on take off
- **Performance:** maximum speed Mach 2.5 at high altitude, service ceiling 60,000ft (18,300m)
- **Dimensions:** wing span 42ft 9 $\frac{3}{4}$ in (13.05m), length 63ft 9in (19.43m), height 18ft 5 $\frac{1}{2}$ in (5.63m), wing area 608sqft (56.50m²)
- **Weights:** empty equipped 28,600lb (12,973kg), maximum take off 68,000lb (30,845kg), weapon load 23,600lb (10,705kg)

MCDONNELL DOUGLAS F-15E STRIKE EAGLE

As F-15C except:

- **Performance:** combat radius 685nm (1,270km) unrefuelled
- **Weights:** operating empty 32,000lb (14,515kg), maximum take off 81,000lb (36,741kg), weapon load 24,500lb (11,113kg)

◀ A 4th TFW weapon system operator (WSO) signals confidently from the rear cockpit of an F-15E. Once Desert Shield became Desert Storm, the Strike Eagle's immature weapons capabilities initially restricted its operational effectiveness. *TSgt Hans Deffner/DoD*



Armed with AIM-7 AAMs on their shoulder hardpoints and AIM-9s underwing, these 1st TFW F-15Cs were under guard at Dhahran during Desert Shield. *DoD*



These 33rd TFW F-15Cs took time out of a Desert Storm sortie to formate with an RSAF F-5E. The Saudi F-5s flew attack missions throughout Desert Storm, losing one of their number on February 13. *Senior Airmen Chris Putnam/DoD*

Air-to-air

For the air-to-air Eagles, the war's opening night provided the opportunity to draw first blood. 'Wall' formations – with as many as eight Eagles in line abreast formation – fanned out in front of the strike packages as they entered Iraq. Acting almost like a fisherman's net, they corralled the Iraqi air force fighters then killed them when they came within range of their AIM-7 Sparrows or AIM-9 Sidewinders. The Eagles claimed four kills that night, despite the fact that very stormy weather had caused havoc with their timings.

Eagles escorting Strike Eagles on a *Scud*-hunting mission scored kills seven and eight on Day 3. Another four were claimed and awarded that day, bringing the total to 12. At this point the Iraqi Air Force effectively stood down, but Strike Eagles and other Coalition fighters began 'plinking' Iraq's hardened aircraft shelters – dropping LGBs onto 375 of them and destroying 117 MiGs, Mirages and Sukhois supposedly safely ensconced within.

Under Hussein's direction, the Iraf began evacuating its aircraft and on Day 10 the Eagle's killing spree continued. In the 48-hour period that followed, seven more kills were scored against Iraqi fighters attempting to flee to the relative safety of Iran.

Scud-hunting challenge

For the Strike Eagle, success was less easy to define. It had done well against fixed targets and only two F-15Es were lost to enemy action during the war, yet the mobile *Scud* threat had not been adequately dealt with: Iraq had been able to launch *Scuds* against Saudi Arabia and Israel with relative impunity.

The *Scud*-hunting challenge was significant for a number of reasons. Firstly, the Iraqi operators were true masters of camouflage and deception, placing *Scuds* beneath culverts, and (it

later transpired) using civilian Winnebago camper vehicles to transport missiles in plain sight.

Secondly, the Strike Eagle's AAQ-14 target pod was in critically short supply (to the point that often only one aircraft in a formation of four would be equipped). It also lacked the resolution necessary to accurately identify a mobile *Scud* camp. More than once, post-combat analysis showed that a 'mobile *Scud* launcher' struck by an LGB had actually been a train of camels or a large herd of sheep.

On a more positive note, the Strike Eagle joined the air-to-air kill club in mid-January, after a crew successfully guided a 2,000lb GBU-10 LGB onto a hovering Iraqi helicopter.

Overall, through the brief Desert Storm conflict the Eagle and Strike Eagle performed exceptionally well. The F-15E flew 7,700 combat hours in around 2,400 sorties, while the F-15C claimed its 34th and final kill of the conflict on Day 65. ❖

SAUDI EAGLES

The Royal Saudi Air Force had taken its first F-15C/D Eagles in 1981 and used the type to down a pair of errant Iranian F-4 Phantoms in 1984. The RSAF's overall effectiveness was considered somewhat erratic by USAF standards, however, and its Eagles were restricted to border patrols during Desert Storm – so-called 'goalie CAP' (combat air patrol).

An RSAF F-15C downed a brace of Mirage F1EQs during the campaign, reportedly under USAF guidance. In contrast, one Saudi pilot apparently defected to Khartoum, Sudan, to avoid fighting a Muslim nation. His aircraft was back in RSAF service by 1994.

ACKNOWLEDGEMENT:
Based on an extract from
McDonnell Douglas/
Boeing F-15 Eagle
Owner's Workshop
Manual by Steve Davies
and published by Haynes



A boom operator's view as an F-15C takes fuel during a Desert Shield mission. *TSgt Marv Lynchard/DoD*



A 363rd TFW(P) F-16C of the 17th TFS, 33rd TFW prepares to taxi for its part in the first wave of attacks on Iraq. It carries a pair of 2,000lb Mk 84 bombs underwing and an ALQ-119 ECM pod on the centreline. *TSgt Perry Heimer/USAF*

F-16 FIGHTING FALCON

The most ubiquitous Coalition 'striker', the F-16 was somewhat hampered by its lack of precision navigation and weapons systems

As the most numerous type in the USAF's tactical inventory, the General Dynamics F-16 Fighting Falcon – universally known as the Viper – deployed en masse for Operation Desert Shield. Alongside the A-10, the F-16 comprised the major part of the Coalition attack fleet, the 250 or so aircraft in the Gulf flying between 300 and 400 sorties during each day of Desert Storm, amounting to 25% of the Coalition effort.

Designed as a lightweight air-to-air complement to the heavyweight F-15, by 1990 the Viper was well established in USAF service as what would traditionally have been called a fighter-bomber, with air combat a secondary role. Early C-model F-16s deployed alongside F-16As, all of them lacking the precision targeting capability that proved fundamental over Kuwait and Iraq.

In an interview soon after the end of hostilities, one 157th TFS, South Carolina ANG F-16A pilot recalled: "In the A-model you're doing well if you get to within two

miles of a given set of co-ordinates." Equipped in the main part with unguided bombs and cluster munitions, and forced to bomb from medium altitudes to avoid intense Iraqi AAA fire, the F-16's effectiveness against vehicles and other small targets was limited.

In an effort to overcome their reliance on visual target acquisition, the F-16 community developed Pointer Forward Air Control (Pointer FAC) tactics. These employed a pair of F-16s assigned to one of the 30x30 mile 'kill boxes' into which the theatre was divided. While one jet navigated for the formation and kept an eye out for enemy activity, the pilot of the second Viper used binoculars to spot targets. Identified by their 'Pointer' call sign, the FACs called other F-16s onto identified targets, marking them with cluster weapons or 500lb Mk 82 bombs.

The F-16 force formed five tactical fighter wings, based in Saudi Arabia, Turkey, Qatar and the UAE. Those deployed from the 23rd TFS employed

GENERAL DYNAMICS F-16C BLOCK 40 FIGHTING FALCON

- **Powerplant:** one General Electric F110-GE-100 turbofan rated at 27,600lb (122.8kN) thrust with afterburning
- **Performance:** maximum level speed at 40,000ft (12,200m) more than Mach 2, service ceiling above 50,000ft (15,240m), radius of action more than 500nm (925km)
- **Dimensions:** wing span over missile rails 31ft (9.45m), length 49ft 4in (15.03m), height 16ft 8½in (5.09m), wing area 300sqft (27.87m²)
- **Weights:** empty 19,020lb (8,627kg), typical combat 23,765lb (10,780kg), maximum take-off 42,300lb (19,187kg), maximum stores load 12,000lb (5,443kg)

F-16 DEPLOYMENT

UNIT	MODEL	BASE
4th Tactical Fighter Wing (Provisional) 157th TFS, 169th TFG, South Carolina ANG 138th TFS, 174th TFW, New York ANG	F-16A Block 10	Al Kharj AB, Saudi Arabia
363rd Tactical Fighter Wing (Provisional) 17th TFS, 33rd TFW, Shaw AFB, South Carolina 10th TFS, USAFE, Hahn AB, Germany	F-16C Block 25	Al Dhafra AB, Sharjah, UAE
388th Tactical Fighter Wing (Provisional) 4th and 421st TFS, 388th TFW, Hill AFB, Utah 69th TFS, 347th TFW, Moody AFB, Georgia	F-16C Block 40	Al Minhad, UAE
401st Tactical Fighter Wing 614th TFS, USAFE, Torrejón AB, Spain	F-16C Block 30	Qatar
7740th Composite Wing Det 1, 401st TFW, USAFE, Torrejón AB, Spain 23rd TFS, 52nd TFW, USAFE, Spangdahlem AB, Germany	F-16C Block 30	Incirlik, Turkey



▲ Although F-16s retained wing tip AIM-9 AAMs throughout the campaign, the real threat came from AAA and SAMs, rather than Iraqi fighters. With empty centre wing pylons, this Viper was returning from a Desert Storm mission. *TSgt Perry Heimer/USAF*

◀ Groundcrew lend scale to a Mk 84. The F-16 took two of these large weapons into combat, pilots often adding a burst of 30mm fire from the aircraft's internal Vulcan cannon to the bombs' effect as they pulled off target. These 401st TFW Block 30s were in Qatar. *SSgt Lee F Corkran/USAF*



The Coalition made extensive use of cluster munitions, which proved particularly effective against area targets, especially personnel and soft vehicles. They were also successfully used against SAM sites. Here, SUU-65/B munitions dispensers are loaded onto a triple-ejector rack (TER) on an F-16's centre wing pylon, in the so-called 'slant two' configuration. *TSgt Marvin Lynchard/USAF*



This 388th TFW Block 40 was over the Red Sea during Desert Storm. The empty TERs suggest that it may have been returning from a mission. *Senior Airman Chris Putnam*



South Carolina ANG F-16As share ramp space at Al Kharj with C-130 Hercules. DoD

TSgt Perry Heimer/USAF



Several F-16s gained Desert Storm nose art. **FEEL LUCKY** threatens Iraqi pilots with the AIM-9; ironically, the Viper was denied air-to-air combat during the conflict.

AGM-45 Shrike and AGM-88 High-Speed Anti-Radiation Missiles (HARMs) against Iraqi radars, working alongside specialist F-4G Phantom Wild Weasels.

The 174th TFW arrived in theatre with the unique GPU-5 cannon pod. Intended for use against armoured targets, the weapon was unsatisfactorily integrated onto the jet and its use abandoned after the first day of combat.

Still new to service in 1990, the F-16C Block 40 offered precision targeting and navigation through the LANTIRN system, but the 388th TFW, the sole unit equipped, took only the navigation portion of the system into combat. Testing of GPS equipment for the Block 40 had been completed in June 1990 and upgraded aircraft were used as 'Killer Scouts' later in Desert Storm. Their more accurate navigation systems enabled them to guide less well-equipped F-16s onto targets.

A plan to use F-16s as LGB carriers for designation by F-111Fs came to nothing and while limited use of the AGM-65 Maverick was made, the Viper community

This 614th TFS Viper was up for a Desert Shield sortie.

SSgt Lee F Corkran/USAF



was generally restricted to dumb bombing. As such, the F-16 achieved a degree of success through sheer numbers, but was no match for the F-15E, F-111 and Tornado in accuracy.

The USAF lost five F-16s in combat and two to training accidents. Bahrain is also reported to have flown F-16A attacks, employing its Vipers alongside Northrop F-5E Tiger IIs. ❖

Home based in Spain, the 614th TFS flew from Qatar for Desert Storm. The four-Sidewinder fit, carried here on one of the first strikes of the war, was abandoned once the Iraqi Air Force had been defeated.

SSgt Lee F Corkran/USAF





CH-47 CHINOOK

Some of the RAF Chinooks received a black 'squiggle pattern' over their desert pink. The disruptive effect was applied for operations in darkness. *Wikimedia Commons*

The twin-rotor Chinook proved the workhorse transport for US Army and British troops as they advanced at speed into Kuwait and on into Iraq



◀ In keeping with the majority of RAF aircraft deployed for Operation Granby, the Chinooks received an overall coat of 'desert pink' paint.

RAF (AHB)/© UK MoD Crown Copyright 2016

▶ During Desert Shield and Storm, US Army Chinooks lifted heavy equipment – represented here by a 105mm M102 towed howitzer and M998 HMMWV – personnel and even unserviceable helicopters.

Specialist Samuel Henry/US Army



Another platform developed during the Vietnam War era, the Boeing Helicopters CH-47 Chinook remained in service as the US Army's only medium-lift helicopter, albeit to the latest CH-47D standard. Chinooks from across the Army descended upon Saudi Arabia during Desert Storm, with airlifted machines in the vanguard and many more following by ship.

Under the US Army's AirLand Battle concept, helicopters were closely integrated into its tactics and Chinooks, escorted by Apache gunships, were vital to the rapid forward movement that followed the commencement of the ground war. They were also instrumental in the westward movement of troops and materiel into the Iraqi desert that so successfully isolated the country's invading army.

Much of the Army helicopter flying was at very low altitudes, the featureless terrain and obstacles posing their own particular hazards. The only US Army

Chinook loss occurred on March 1, 1991, just after the ceasefire, when Major Marie T Rossi's aircraft flew into a transmission tower, killing all onboard. She was the highest ranking US officer killed during the campaign.

RAF Chinooks

An initial three Chinook HC.Mk 1B aircraft were airlifted to Saudi Arabia by C-5 late in November 1990, to be joined by eight more delivered by sealift on January 6, 1991 and four more by air later in the month. British troops had relied on US helicopter support, but as their numbers swelled, the RAF aircraft were urgently needed in theatre.

Chinooks and personnel from 7 Sqn at Odiham, Hampshire and 18 Sqn at Gütersloh, Germany combined to form Chinook Squadron Middle East, part of Support Helicopter Force Middle East. The aircraft were involved in the outflanking manoeuvre initiated on February 24 and moved with British troops as they advanced into Kuwait. ❖

BOEING HELICOPTERS CH-47D CHINOOK

Performance for aircraft taking off at 42,280lb (19,178kg) at 4,000ft (1,220m) at 35°C (95°F)

■ **Powerplant:** two Textron Lycoming T55-L-712 turboshafts each rated at 3,750shp

■ **Performance:** maximum level speed at sea level 161kt (185mph), mission radius 30nm (55.5km)

■ **Dimensions:** main rotor diameter, each 60ft (18.29m); length, rotors turning 98ft 10¼in (30.14m); overall height to top of rear rotor head 18ft 8in (5.68m), combined main rotor disc area 5,655sqft (525.30m²)

■ **Weights:** empty 23,149lb (10,500kg), maximum take-off 54,000lb (24,494kg), payload 15,612lb (7,081kg)

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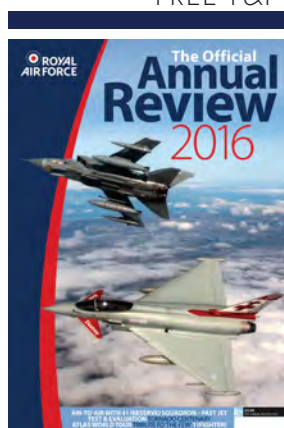


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US ARMY

The US Army's aviation responsibilities did not stop with its vast helicopter fleet. It also operated Patriot and, as here, MIM-23 Hawk SAM batteries. *Spc Samuel Henry/US Army*

The US Army used its huge helicopter fleet to move troops and equipment rapidly or covertly as the mission required, as well as reconnoitring the battlefield and engaging Iraqi armour

Hundreds of US Army helicopters were moved into Saudi Arabia. An advanced guard arrived by airlift, in preparation for any continued Iraqi movement beyond Kuwait. Meanwhile, many more aircraft were prepared for movement by sea, reinforcing the units already in theatre.

The Army had redefined helicopter warfare during the Vietnam War, moving troops rapidly between landing zones in 'slick' Bell UH-1 transports, often accompanied by armed UH-1 'hogs'. Loaded with weaponry, the hog suffered diminished performance and Bell developed the AH-1 HueyCobra attack helicopter in response.

Between them, the UH-1 and AH-1, alongside the Army's helicopter muscle, the CH-47 Chinook, became the cornerstone of Army Aviation. But having evolved helicopter warfare, the Army had subsequently set out to perfect it with modern new equipment.

Thus, by August 1990 the Sikorsky UH-60 Black Hawk had replaced the UH-1 in many units and augmented it in others, while the AH-1 was rapidly giving way to the impressive Apache. The Army had also developed the helicopter scout concept, so that the Bell OH-58 Kiowa was in widespread use across the theatre, working closely with Apache and Marine Corps AH-1 units on the battlefield.

Helicopter Allocation

Aviation is integral to US Army warfighting and the 82nd and 101st Airborne Divisions, as well as multiple battalions and assorted other units, all brought their dedicated helicopter assets to the Gulf – much of them from Germany. By way of example, the 82nd Airborne was complete with OH-58A/D, UH-60A and AH-64A helicopters that it brought from Fort Bragg, North Carolina, while the 6th Battalion, 159th Aviation Regiment brought UH-1Hs, CH-47Ds and UH-60As from Germany.

The major part of Army air power was, of course, rotary, but the service also employed the fixed wing Beech RC-12 and Grumman OV/RV-1D Mohawk on intelligence gathering missions. Regular C-12 and Shorts C-23B Sherpa transports were also used on logistics flights across the region.

The Army lost two OH-58s, at least two UH-60s and a UH-1 in combat, plus a UH-60 in a pre-war training accident and a CH-47, UH-1 and UH-60 in the immediate post-war period. ❖



Much of the Army's flying relied on forward arming and refuelling points set up at remote locations in the desert. Mannned by the 101st Airborne, this one was refuelling a UH-60. *Wikimedia Commons*

AH-64 APACHE



The Apache spearheaded the advance and worked closely with other aviation units. Here 82nd Airborne helicopters prepare to move to a new operating location prior to Desert Storm.

Senior Airman Kern/USAF

The source of considerable angst over reliability issues since its full-scale entry into service in 1986, the Apache emerged as one of the stars of Desert Storm. Nevertheless, there were still maintenance and reliability problems to overcome, Saudi Arabia's alternatively wet (10in (254mm) of rain fell on at least one Army base in January 1991), arid, dusty and extremely hot conditions initially taking their toll.

By the opening night of Desert Storm the issues had been solved and Apaches famously fired the first rounds of the war. They went on to attack tanks and other targets in Kuwait and Iraq, before their finest hour, during the ground war that began on February 24. Flying as low as they dared and keeping out of the range of the heavy machine guns mounted on almost every Iraqi military vehicle, the Apaches roamed almost at will.

Much of their work was directed towards 'corridors' through which ground troops were to pass. Using intelligence derived from other aircraft, including the USAF's E-8 J-STARS, satellites and special forces, they worked with the OH-58 Kiowa scouts to systematically clear Iraqi tanks and other vehicles using laser-guided Hellfire missiles, 70mm rockets and 30mm cannon fire.



◀ The Army's transport helicopters were expected to have an important 'dust off', or casualty evacuation role, once the ground war began. In the event they were barely needed at all, but this Desert Shield training serial shows how a Chinook might have been employed. *Spc Daniel Jackson/US Army*

▼ The UH-60 Blackhawk could be flown with its doors removed, enabling rapid boarding and departure for troops, as well as providing welcome ventilation. *Ian Black*





▲ Much of the battlefield transport helicopter's utility comes from its ability to move personnel in the cabin and outsize loads, such as artillery pieces, underslung. These 2nd Battalion, 82nd Airborne UH-60s were moving M102 howitzers during Desert Shield.

Brian Cumper/DoD

◀ A pre-flight inspection for an OV-10 prior to a Desert Storm mission.

Sgt Prentes Trambue/US Army

OH-58 KIOWA



Bell OH-58D Kiowa Warrior 85-24727 served 'H' Company, 4th Brigade, 3rd Aviation Regiment, 3rd Infantry Division.

Andy Hay/Flyingart

Present in its OH-58A, C and D versions, the Kiowa flew observation and reconnaissance missions, most importantly for the Apache. Equipped with a mast-mounted sight and with provision for Hellfire and rockets, the OH-58D Kiowa Warrior had the potential for autonomous anti-armour work, but instead used its sensors over the battlefield to further the Apache's reach. Army Special Forces flew a small number of Warriors from ships, engaging air defence installations on Iraqi-held oil platforms, among other targets.

US MARINE CORPS

US Marine Corps helicopters were instrumental in the mass movement of troops into Kuwait and Iraq, while the Corps' fixed-wing air power delivered close support and ranged almost at will across Kuwait

The US Marine Corps assembled what amounted to an independent air force in preparation for Desert Storm. Its mix of A-6E, AV-8B, EA-6B and F/A-18A/C/D fast jet squadrons enabled a broadening of missions well outside those of the close support traditionally delivered by USMC air power. While CAS undoubtedly remained important once the ground war began, Marine aircraft also flew battlefield air interdiction, jamming and SEAD missions.

Most of the Corps' fixed-wing assets, including the Rockwell OV-10 Bronco CAS/observation turboprop and KC-130 tanker, flew from land bases, although one Harrier unit flew off USS Nassau. The Harriers also ventured out into the desert, frequently operating from forward arming and refuelling points.

A major helicopter operator, the Marine Corps moved its troops with CH-46 Sky Knight, CH-53 and UH-1N helicopters, although the latter often worked in close co-operation with its AH-1J and AH-1W Cobra attack helicopters. Large numbers of all three transport types found homes at Abdul Aziz and Ras Al Gar, but many more were embarked in several amphibious assault ships.

As well as four Harriers, the USMC lost four Broncos in combat.



Cobras, Sea Knights and Hueys line USS Nassau's deck as a Harrier blasts off on a Desert Shield training mission. PH1(AC) Scott M. Allen



Named *Pamela Dawn*, this CH-46E Sea Knight flew with HMM-161 at Abdul Aziz. Andy Hay/Flyingart



In Saudi Arabia during the Desert Shield period, this OV-10A Bronco was on strength with VMO-2. Wikimedia Commons

F-4 PHANTOM II



The Phantom fought its last war in US hands during Desert Storm. Flying combat in F-4G and RF-4C models, it performed essential SEAD and tactical reconnaissance missions

Having been a stalwart of the air war over Vietnam, the McDonnell Douglas F-4 Phantom II joined with the F-111 and the US Navy's A-6 and A-7 in performing its combat swansong over Iraq. USAF Phantoms deployed to Turkey and Bahrain, the former taking F-4G suppression of enemy air defences (SEAD) Wild Weasels, RF-4C tactical reconnaissance aircraft and F-4E fighter-bombers with precision bombing capability, although the latter saw little or no combat.

Equipped with the APR-47 radar homing and warning system, the F-4G enabled the Electronic Warfare Officer sitting in its rear seat to locate, analyse and prioritise air-defence radars for attack. Primary armament was the highly effective AGM-88 HARM and the F-4G was the only platform to employ it in this precise manner. The less capable, older but cheaper AGM-45 Shrike was briefly preferred

over HARM, until the advantages of the more modern missile were explained and high command re-authorised its combat use.

Flying out of Incirlik for Desert Storm, the 52nd TFW had trained to use its F-4Gs in concert with the F-16C. After the F-4G had located and killed radars with its specialist systems, the F-16s moved in with 'iron' bombs or cluster munitions to devastate surviving antennas and support vehicles.

The US Navy boasted a comparable capability with its HARM-shooting EA-6B Prowlers, but these were primarily jamming assets, while other tactical aircraft also fired HARM, but less effectively. Likely numbering no more than 70 deployed aircraft, the F-4Gs were crucial to the overall effectiveness of Coalition air strikes, seriously degrading the Iraqi IADS. They flew 8,587 hours during the Desert Storm campaign, in 2,331 sorties. ➡

MCDONNELL DOUGLAS RF-4C PHANTOM II

- **Powerplant:** two General Electric J79-GE-15 turbojets each rated at 17,000lb (75.62kN) thrust with afterburning
- **Performance:** maximum level speed 'clean' at 40,000ft (12,190m) 1,267kt (2,348km/h), maximum level speed 'clean' at sea level 780kt (2,445km/h), service ceiling 59,400ft (18,105m), combat radius 730nm (1,353km)
- **Dimensions:** wing span 38ft 5in (11.71m), length 62ft 11in (19.17m), height 16ft 6in (5.03m), wing area 530sqft (49.24m²)
- **Weights:** basic empty 28,276lb (12,826kg), maximum take-off 58,000lb (26,308kg), maximum stores load 16,000lb (7,257kg)

'BH' tailcodes show this RF-4C hails from the ALANG's 106th TRS; it was parked at Sheikh Isa AB on the opening day of the war. The large centreline drop tanks employed by the RF-4C units were 'borrowed' from the F-15 community. *Sgt Jeff Wright/USAF*



F-4 PHANTOM II DEPLOYMENT

UNIT

7440th Composite Wing
3rd TFS, 3rd TFW, Clark AB, Philippines
23rd TFS, 52nd TFW, Spangdahlem AB, Germany
26th TRW, Zweibrucken, Germany

35th Tactical Fighter Wing (Provisional)

81st TFS, 52nd TFW, Spangdahlem AB, Germany
561st TFS, 35th TFW, George AFB, California
106th TRS, Alabama ANG (August to December 1990)
192nd TRS, Nevada ANG
67th TRW, Bergstrom AFB, Texas

MODEL

F-4E
F-4G
RF-4C

BASE

Incirlik AB, Turkey

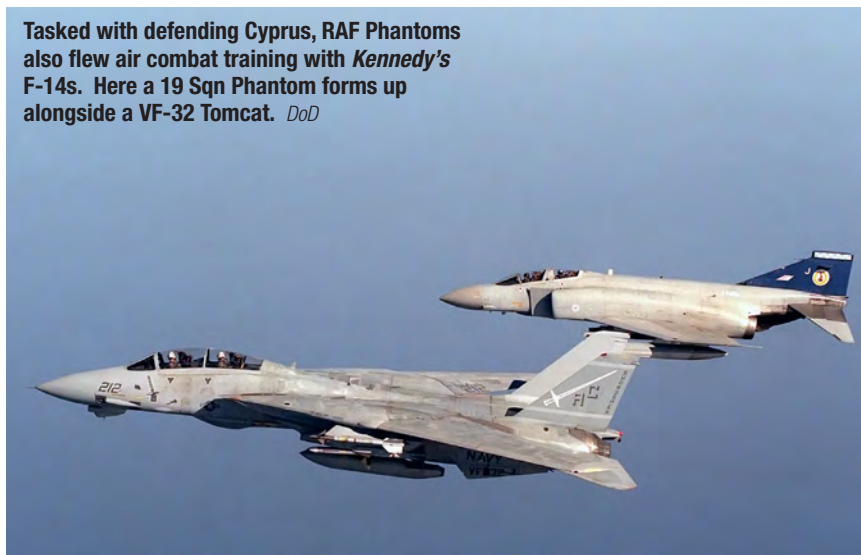
Sheikh Isa AB, Bahrain

RAF PHANTOMS

On August 17, 1990, six Phantom FGR.Mk 2 jets from the RAF's 19 and 92 Squadrons arrived at RAF Akrotiri, Cyprus from Wildenrath, their home station in Germany. Replacing ten Tornado F3s from 5 and 29 Sqn, they were tasked with the island's air defence.

In the event, Iraq's air force never looked towards the Mediterranean, but the Phantoms took the opportunity for dissimilar air combat training with VF-14 and VF-32 Tomcats, flying off USS *John F Kennedy* as it sailed through the Med on its way to take up station in the Red Sea.

Tasked with defending Cyprus, RAF Phantoms also flew air combat training with *Kennedy's* F-14s. Here a 19 Sqn Phantom forms up alongside a VF-32 Tomcat. *DoD*



Home based in Germany, the 52nd TFW specialised in combined F-4G/F-16C SEAD work. *TSgt Fernando Serna/USAF*



This 106th TRS RF-4C, 64-1047, returned to Alabama with a large tally of 'camel' mission marks. *Wikimedia Commons*



Wearing the famous 'WW' tailcodes of the 35th TFW, these F-4Gs each carry a brace of AGM-88s on a Desert Shield training mission. The Phantom had four fuselage hardpoints originally intended for semi-recessed Sparrow AAMs, but the F-4G's forward port station usually mounted an ECM pod. In the case of 35th TFW jets, this was typically an ALQ-184. *USAF*

Recon Phantom

Representing the entirety of USAF tactical reconnaissance capability, the veteran RF-4C initially deployed for Desert Shield in August 1990, after the 106th Tactical Reconnaissance Squadron (TRS), Alabama ANG (ALANG) called for volunteers to take six aircraft equipped with the 66in focal length KS-127 long-range oblique

photography (LOROP) camera into theatre. Flying along the border, the jets used their KS-127s to peer as far as 50 miles (80km) inside Iraq, adding imagery intelligence to the electronic order of battle.

After an ALANG Phantom was lost in an accident, the Mississippi and Nevada ANGs each deployed single aircraft and although the Alabama Phantoms remained

in Bahrain, it was Nevada crews that took them to war. Another RF-4C was lost in a post-war accident.

The recon Phantoms flew only daylight combat operations, including vital *Scud*-hunting missions. The aircraft based in Turkey arrived only on February 3, but flew their first missions on the 5th, scouring western Iraq for *Scuds*. ♦



B-52G STRATOFORTRESS

On its way back to base after a February Desert Storm mission, this B-52G was taking fuel from a KC-135. USAF

As it had in Vietnam, the B-52 delivered tons of ordnance onto strategic targets from high altitude. Later its attention was turned to troop positions and other soft targets, with devastating effect



A 1708th BW(P) B-52G launches with full bomb racks on its underwing pylons.
Senior Airman Chris Putnam/USAF

nfamous for its ability to haul massive ordnance loads and for the destructive and psychological impact of their delivery, Boeing's B-52 Stratofortress was among the first types called to Desert Shield duty. Universally known as the BUFF, for Big Ugly Fat 'Fellow', the B-52's appearance in the Coalition build up sent a powerful message to Iraq's leadership that the US meant business.

Since Strategic Air Command's B-52H was assigned nuclear duties, the B-52G's conventional bombing capabilities were called upon. When Iraq invaded Kuwait in August 1990, a force of 20 B-52Gs was at Anderson AFB on Guam for Exercise Giant Warrior and immediately flew to Diego Garcia in the Indian Ocean, within striking distance of Iraq.

As the BUFF force gradually expanded, so SAC drew aircraft and personnel from across its six G-model bomb wings, using them to establish four temporary units: the 801st Bomb Wing (Provisional) at Moron, Spain; 806th BW(P) at Fairford, UK; 1708th BW(P) at Jeddah/King Abdul Aziz

International Airport, Saudi Arabia; and 4300th BW(P) on Diego Garcia.

BUFF attacks

The B-52s usually attacked in three-ship 'cells', typically delivering 153 750lb M117 bombs in a single pass and creating a swathe of destruction roughly 1 mile (1.6km) wide by 1.5 miles (2.4km) long. BUFF targets initially comprised power stations and other strategic installations in Northern Iraq, but their attention soon turned to the well dug in Republican Guard units and other Iraqi troop positions in preparation for the ground war. In all the B-52s delivered approximately 27,500 tons of bombs in 1,624 missions.

Contemporary reports note that one aircraft was forced to ditch into the Indian Ocean after technical failure, with the loss of three crew. Another apparently lost its tail gun position to an AGM-88 HARM that may inadvertently have homed onto one of the bomber's defensive aids, although Iraqi sources make reference to a BUFF being intercepted and damaged by a MiG-29. ❖

▼ B-52 ordnancemen train with M117 bombs during Desert Shield. Fitted with conical nose plugs, these weapons are to M117R standard, complete with the MAU-91 retarding tail. CMSgt Don Sutherland/USAF



BOEING B-52G STRATOFORTRESS

- **Powerplant:** eight Pratt & Whitney J57-P-43WB turbojets each rated at 13,750lb (61.16kN) thrust
- **Performance:** maximum level speed 'clean' at high altitude 516kt (957km/h), service ceiling 40,000ft (12,190m), range more than 6,513nm (12,070km)
- **Dimensions:** wing span 185ft (56.39m), length 160ft 11in (49.05m), height 40ft 8in (12.40m), wing area 4,000sqft (371.60m²)
- **Weights:** maximum take-off more than 488,000lb (221,357kg), maximum stores load approximately 50,000lb (22,680kg)

THE STORM SUBSIDES

This massed F-16 raid was typical of the large-scale daylight operations carried out almost from the very beginning of Desert Storm. *TSgt Perry Heimer*

The Coalition fought a constant battle with *Scud* missiles throughout the campaign, but the land battle, which began on February 24, came to a swift conclusion. Four days later, Desert Storm was over

With the resounding success of the first night's strikes and having suffered minimal losses, Coalition leaders were confident enough to continue with the pre-ordained air campaign. Daylight raids began at first light on January 17, with strikes continuing against airfields, command and communications and other strategic targets.

Attention also turned to other military targets in Kuwait and Iraq, as the country's ability to wage war was systematically degraded. Troop concentrations, SAM sites, armour, artillery pieces and vehicles came under attack from fixed-wing aircraft and helicopters, guided into their target areas by the Coalition's overwhelming intelligence-gathering effort.

The *Scud* missile was a particularly troublesome threat to the Coalition, however. As early as December 24, 1990, Hussein had declared that Israel would be his first target should the Coalition attack. Israel was certain to retaliate and its inclusion in the war might be enough to drive the Arab nations from the Coalition. A massive reconnaissance and strike effort was therefore mounted against fixed *Scud* sites and mobile launchers.

Israel was attacked nonetheless, as were facilities in Saudi Arabia, but Patriot missile batteries defeated enough of

the missiles to relieve the threat, while Coalition warplanes scoured the desert day and night to eradicate the launchers. The task remained difficult, tactical reconnaissance platforms – particularly the Tornado GR1A – doing their utmost to find the weapons, but they had often been driven away by the time strikers arrived. A satisfactory solution to this time-sensitive targeting issue was never fully realised.

Scud strikers

The F-15E was among the assets tasked against the *Scud* threat by day and night, and its crews' experience demonstrated that Iraqi SAMs and AAA continued to pose a real threat. Following waves of night strikes against airfields, fixed *Scud* sites and other targets, the F-15E Strike Eagles flew their first daytime attacks, using the dive toss tactic to put bombs on target from the relative sanctuary of medium level.

Rolling the jet inverted from 30,000ft and diving towards the target for final visual verification, the pilot would pull out no lower than 15,000ft, the approximate ceiling for the majority of Iraqi AAA. If the target was not accurately designated, the pilot slewed the target diamond in his HUD over the correct spot before hitting the pickle button.

Jerry 'One Y' Oney and Bill 'Shadow' Schaal flew their first two missions in daylight, which was a little disconcerting, as Oney explains, "I sort of liked the advantage the night gave us, but during the first mission Bill saw a guy heading west pulling a boat down one of the major highways in Iraq. We both had a good chuckle before we slung our CEMs [CBU-87s] at some *Scuds* Intel [intelligence] had previously located for us. Didn't see much of anything in the way of either air-air or air-ground threats during our ingress or egress, but I can tell you we had the radar working overtime and checking-six wasn't just a casual pastime.

"We were sent after more mobile *Scuds* on our second mission, which was probably our most eventful. Our two-ship had been scheduled on a pre-planned target, but just before step-time we got re-tasked to go after the mobile *Scuds*. Apparently a two-ship of Hogs had been looking for these things, but bingo'd out [run short of fuel] and gone home, so we were sent to have a look.

"The *Scuds* were supposed to be somewhere along a road in south-eastern Iraq, so we pressed up there as quickly as we could. We crossed the border, went to a trail formation, and started looking for

Based on the Boeing 707 airframe, the Grumman E-8A J-STARS was still in development at the time of Desert Storm. Both prototypes were deployed, flying 600 hours in combat as they tracked vehicle movements. *Andy Hay/Flyingart*



The Strike Eagle became deeply involved in the anti-*Scud* campaign.

PHAN Chad Vann/DoD



the bad guys. In the process we found a smallish Iraqi AAA site/encampment and patch-mapped it for future use. Personally, I wanted to sling at least one Mk 82 on the camp, but we had other priorities at the time.

“Well, there we were, a couple of the USAF’s finest, flying the mighty Strike Eagle at around 2,000ft, below a mostly scattered cloud deck, in a two-mile trail, doing 500kt, and doing road-recce looking for *Scuds*. Even then I was thinking, ‘this isn’t the greatest idea in the history of earth’. I was soon proved correct as we flew past an Iraqi airfield and saw the smoke trail of an SA-7, or maybe an SA-9, heading past us and towards lead [the lead F-15E].

“As luck would have it, lead had just looked over his right shoulder starting an easy right turn, and saw the missile smoke trail heading his way. The next bit of action seemed compressed into about two seconds or less: lead broke hard into the missile in an attempt to defeat it; I watched it overshoot and detonate about 500ft above him (I could’ve sworn I actually heard the thing explode). Bill manoeuvred hard to avoid lead as we now had a big face-full of F-15E heading more or less right towards us; damn but an Eagle can turn!

“I felt our ordnance and fuel tanks come off as Bill calmly punched the jettison button in his attempt to avoid hitting lead, and to get our weight down in anticipation of another shot coming our way. We continued our evasive action more or less to the north, and lead continued his hard manoeuvring heading south. We eventually joined up a few minutes later – the APG-70 radar is a wonderful thing!

“Our day wasn’t done yet, though. We regrouped, got our noses in the same direction, got back into a trail formation, got down low, got real fast and headed home. But we managed to fly right past that same AAA site I’d wanted to bomb not ten minutes earlier. As we came upon it I could actually see this guy run to his quad-barrelled 23mm gun, swing the thing around, and begin shooting at

The phenomenal Patriot SAM system did much to calm Coalition and Israeli nerves in the face of *Scud* attacks.

Spc Henry/DoD





Coalition warplanes and helicopters caught Iraqi forces in the open on the road back to Baghdad.
Wikimedia Commons

us; at least that is how my mind's eye recalled it once we'd crossed back into Saudi territory.

"In that particular space of time the longest distance in the world was between my brain and my mouth. I wanted to tell Bill all about the guy running to his gun, it turning towards us, and about all the tracers heading our way. The net result of all those efforts was me taking the throttles and slamming them into full A/B [afterburner] to help the situation out. Unbeknownst to me, Bill had seen the entire thing too, and having the throttles flung from his hands with a resounding 'bang' against the stops, thought we'd been hit!

"After we figured out we both had the same situational awareness, Bill's comment was classic and shows what an always-thinking fighter pilot is: "That's a good way to soak up a heater [heat-seeking missile]!" Roger that.



This 23rd TFW A-10A returned to base peppered with battle damage. *Wikimedia Commons*

"As an Air Force brat I'd grown up around a lot of combat aviators. One told me the story of how, unlike everyone else he'd heard on the radio after they got hit with a SAM and/or AAA, he'd be calm and collected should he ever take rounds in his airplane. When that finally happened,

he confessed his voice did indeed go up a few octaves.

"Well, during this AAA event, I was actually replaying his story in my head before telling lead we were taking AAA (probably a wasted radio call anyway), so I reckoned I'd sound cool and calm over the radio. To say I didn't sound like a play-by-play sports announcer hardly does it justice and lead let me know just that!"

Ground War

By February 24, British, French and US armour had been positioned far out in the desert, ready to outflank Iraqi lines of communication and reinforcement into Kuwait and, as it turned out, intercept the enemy as he fled. At 04.00hrs that morning, a powerful force of US Army helicopters moved 2,000 101st Airborne troops 50 miles (80km) into Iraq, where they set up 'Cobra', a supply base and

AH-64 APACHE



The Apache spearheaded the advance and worked closely with other aviation units. Here 82nd Airborne helicopters prepare to move to a new operating location prior to Desert Storm.

Senior Airman Kern/USAF

The source of considerable angst over reliability issues since its full-scale entry into service in 1986, the Apache emerged as one of the stars of Desert Storm. Nevertheless, there were still maintenance and reliability problems to overcome, Saudi Arabia's alternatively wet (10in (254mm) of rain fell on at least one Army base in January 1991), arid, dusty and extremely hot conditions initially taking their toll.

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◀ The Army's transport helicopters were expected to have an important 'dust off', or casualty evacuation role, once the ground war began. In the event they were barely needed at all, but this Desert Shield training serial shows how a Chinook might have been employed. *Spc Daniel Jackson/US Army*

▼ The UH-60 Black Hawk could be flown with its doors removed, enabling rapid boarding and departure for troops, as well as providing welcome ventilation. *Ian Black*





Belonging to HMLA-269, this AH-1W was exercising aboard the amphibious assault ship USS *Nassau* during Desert Shield. Marine Corps helicopters flew from ships and shore bases throughout Desert Storm. PH1 Olson/DoD

H-1 COBRA AND IROQUOIS

Although in decline as more modern types came on line, the AH-1 and UH-1 were important to the US Army's Desert Storm order of battle. Perhaps more significantly, the heavily upgraded AH-1W and more powerful UH-1N supported US Marine Corps operations

Quickly nicknamed 'Huey' in a corruption of its original HU-1A designation, the Bell UH-1 Iroquois helped define a new era in highly mobile warfare in the jungles of Vietnam. Two decades on, the type remained a vital component of US Army and Marine Corps aviation.

The single-engined UH-1H and V models remained in widespread US Army service, although the UH-60 had replaced the Huey as primary troop mover. Nevertheless, the UH-1H flew transport and utility missions between the many and widespread Army outposts established in the Saudi desert, while the V-model continued its specialist medevac (medical evacuation) role throughout the ground war.

A contemporary press release noted 193 UH-1H and 121 UH-1V helicopters in-theatre. Of these, one 'H' was lost during the fighting, another fell to an accident and a third crashed after the ceasefire that ended the war.

The USMC deployed its UH-1Ns with HML-767 and HMLA-167, 169, 269, 367 and 369. The aircraft worked in close co-operation with the Corps' AH-1W gunships, flying as scouts and transports. Rated at 1,800shp, the UH-1N's unusual T400 coupled turboshaft was derated to a maximum of 1,290shp for take-off, enabling it to deliver full power even under the hot-and-high conditions typical of the Arabian desert.

Army Cobras

During the Vietnam conflict, Bell responded to the US Army's need for a dedicated attack helicopter by the radical expedient of hanging a new fuselage off the UH-1's dynamic system and powerplant. The resulting AH-1G HueyCobra pioneered the helicopter gunship concept and quickly evolved into the parallel line of twin-engined SeaCobras for the USMC.

A bewildering array of variants and subvariants followed, while all helicopters

BELL AH-1W SUPERCOBRA

- **Powerplant:** two 1,625shp General Electric T700-GE-401 turboshafts
- **Performance:** maximum level speed 'clean' at sea level 152kt (282km/h), service ceiling more than 12,000ft (3,660m), range 343nm (635km)
- **Dimensions:** main rotor diameter 48ft (14.63m); length, rotors turning 58ft (17.68m); overall height 14ft 2in (4.32m), main rotor disc area 1,809.56sqft (168.11m²)
- **Weights:** empty 10,200lb (4,627kg), maximum take-off 14,750lb (6,691kg), maximum stores load 2,466lb (1,119kg)

of the type were known in service simply as 'the Cobra'. For Operation Desert Shield the US Army deployed its latest AH-1F variant, initially flying helicopters into Saudi Arabia aboard C-5 airlifters. ➡

After the initial move by air, many more US Army helicopters arrived in Saudi Arabia by ship. This UH-1H was among them. *Wikimedia Commons*



The UH-1N is easily distinguished by its wider upper fuselage rear decking and twin exhausts. This HMLA-167 aircraft was engaged on a Desert Storm mission. *DoD*



This UH-1H belonged to 'B' Battery, 1st Battalion, 159th Aviation Regiment, 18th Aviation Brigade, US Army, during Desert Shield. The brigade provided helicopter transport with a fleet of CH-47s, UH-60s and UH-1s. *TSgt Hans Deffner/DoD*

Among the first Army aviation units in theatre, the 82nd Aviation Brigade set up at Dhahran with 18 AH-6A, 12 AH-1F, 31 OH-58 and 41 UH-60 helicopters.

By 1990 the Apache was the US Army's primary anti-armour helicopter, but more AH-1Fs arrived regardless, when the 101st Division was delivered by US Navy fast transport ships. Its aviation element included 36 AH-64As, 21 AH-1Fs, 122 UH-60s, 91 OH-58s and 32 CH-47Ds.

Marine Cobras

Marine Reserve units HMA-773 and 775 took their AH-1J and AH-1T Cobras to the Gulf, but the primary USMC gunship was the AH-1W, flown by HMLA-167, 169, 269, 367 and 369. The 'Whiskey' Cobras soon took over the anti-armour role thanks to their improved sensors and armament, which included the AGM-114 Hellfire. This left the AH-1J/T to provide escort for Marine helicopters moving troops forwards as the Coalition advanced rapidly through Kuwait.

Marine Corps Cobras were crucial in the retaking of Kuwait City, a USMC pilot recalling that when the AH-1Ws

engaged: "...it was slaughter." An attempted Iraqi counterattack was stopped in its tracks.

On January 29, Iraqi forces had invaded Khafji, a town on the Saudi border. Although the Coalition was taken by surprise and the town's Saudi Marine

contingent rapidly withdrew, AH-1Ws responded in force. Using Hellfire and TOW missiles with devastating effect against a variety of targets, including observation posts, they cleared the way for Saudi National Guard and Qatari soldiers to retake the town. ❖

BELL UH-1N IROQUOIS

- **Powerplant:** one 1,800shp Pratt & Whitney Canada T400-CP-400 Turbo Twin-Pac turboshaft
- **Performance:** maximum cruising speed at sea level 123kt (230km/h) service ceiling 14,200ft (4,330m), range 227nm (420km)
- **Dimensions:** main rotor diameter 48ft 2¼in (14.69m); length, rotors turning 57ft 3¼in (17.46m); overall height 14ft 10¼in (4.53m), main rotor disc area 1,871.91sqft (173.90m²)
- **Weights:** empty 6,143lb (2,787kg), maximum take-off 11,200lb (5,080kg), maximum payload 5,000lb (2,268kg)

BELL UH-1H IROQUOIS

- **Powerplant:** one 1,400shp Textron Lycoming T53-L-13 turboshaft
- **Performance:** maximum cruising speed at 5,700ft (1,735m) 110kt (204km/h), service ceiling 12,600ft (3,840m), range 276nm (511km)
- **Dimensions:** main rotor diameter 48ft (14.63m); length, rotors turning 57ft 9¼in (17.62m); overall height 14ft 5½in (4.41m), main rotor disc area 1,809.56sqft (168.11m²)
- **Weights:** empty equipped 5,210lb (2,363kg), maximum take-off 9,500lb (4,309kg), maximum payload 3,880lb (1,759kg)

F-111E/F AND EF-111A

Given the Strike Eagle's immaturity and the specialist nature of the F-117's role, the F-111F was arguably the most versatile precision bomber in the Coalition inventory

▲ Although it left its headquarters element in the UK, the 48th TFW deployed to Taif almost in its entirety. Here the wing commander's F-111F formates with squadron commanders' jets from the 493rd and 494th TFSs, while the Sparkvark belonged to the 390th Electronic Combat Squadron.



As indicated by their 'MO' tailcodes, the 48th TFW(P)'s EF-111As hailed from Mountain Home in Idaho. The fin tip antenna pod associated with the Sparkvark's mission suite is obvious as these jets prepare for a Desert Shield sortie. SSgt Charles Reger/USAF

Another key warplane receiving its final combat outing in US service, the variable-geometry F-111 served in three distinct variants. F-111E and F bombers deployed for Desert Shield from RAF Upper Heyford and Lakenheath, respectively, the F-111F adding the Pave Tack laser-designation system to the F-111E's standard equipment, producing a strike aircraft of outstanding accuracy.

Modified from redundant F-111A airframes, the EF-111A force employed the basic mission suite from the US Navy's EA-6B Prowler jamming aircraft to create an electronic escort aircraft capable of keeping pace with an F-111 strike package. Since the F-111's prominent nose had gained it the nickname 'Aardvark', the EF-111A perhaps inevitably became the 'Sparkvark'.

The F-111Es mounted dumb bombing missions from Incirlik, while the F-111Fs were assigned key targets out of Taif. Employing GBU-15 electro-optically guided bombs and LGBs, the F-models struck vital communications and air defence targets, but moved on to precision engagements with LGBs against tanks – so-called 'plinking' – and HASs as the war progressed.

Two F-111F mission in particular stand out. In the first, GBU-15s destroyed manifolds being used to release oil into the Persian Gulf in a blatant Iraqi act of environmental vandalism, while in the second, 4,700lb GBU-28/B 'Deep Throat' bunker-busting bombs were dropped on the Al Taji airfield north of Baghdad. The latter was a clear indication to the Iraqi leadership that there was nowhere to hide that Coalition air power could not reach. ♦



▲ RAF Lakenheath, Suffolk was no stranger to sending its jets into combat. In 1986 it launched Aardvarks against Libya in a non-stop raid that co-ordinated with US Navy air power in the Mediterranean. Here an F-111F takes off for Saudi Arabia and Desert Shield. DoD

GENERAL DYNAMICS F-111F

- **Powerplant:** two Pratt & Whitney TF30-P-100 turbofans each rated at 25,100lb (111.65kN) thrust with afterburning
- **Performance:** maximum level speed 'clean' at 36,000ft (10,975m), service ceiling 60,000ft (18,290m)
- **Dimensions:** wing span 63ft (19.20m) spread and 31ft 11½in (9.74m) swept, length 73ft 6in (22.40m), height 17ft 1½in (5.22m), wing area 525sqft (48.77m²) spread and 657.07sqft (61.07m²) swept
- **Weights:** operating empty 47,481lb (21,537kg), maximum take-off 100,000lb (45,360kg), maximum stores load 31,500lb (14,228kg)

F-111/EF-111 DEPLOYMENT

UNIT

48th Tactical Fighter Wing (Provisional)

492nd TFS, 493rd TFS, 494th TFS, 495th TFS,
RAF Lakenheath, UK
390th ECS, 366th TFW, Mountain Home AFB, Idaho

7440th Composite Wing
55th TFS, 77th TFS & 79th TFS, 20th TFW,
RAF Upper Heyford, UK
42nd ECS, 20th ECW, RAF Upper Heyford, UK

MODEL

F-111F
EF-111A

F-111E
EF-111A

BASE

King Fahd AB, Taif,
Saudi Arabia

Incirlik AB, Turkey

Saratoga turns into wind during its Desert Storm deployment. An SH-3H has just launched from its bow, while F-14A(Plus), F/A-18C, E-2C, KA-6D and A-6E aircraft can be seen spotted on deck. [Wikimedia Commons](#)

US NAVY

It is often said that when a crisis is brewing, the US President's first question is: "Where are the carriers?" For Desert Storm they were in the Persian Gulf and Red Sea

US Navy air power centred on six carriers during Desert Storm, although two others – USS *Independence* and *Dwight D. Eisenhower* – were present during Desert Shield. Each carrier embarked an aircraft complement easily the equivalent of a moderately sized air force, with strike, fighter, reconnaissance, tanker and rotary-wing assets.

The naval presence also expanded to the helicopters embarked on each of the many smaller vessels in the Gulf and Red Sea, most of them Kaman SH-2 Seasprites and Sikorsky SH-60 Seahawks. There was also a scattering of CH/HH-46, CH-53 and SH-3 helicopters, primarily for ship-to-ship and ship-to-shore support. Adding to these,

the carriers were frequent stops for the Grumman C-2 Greyhound transport as it moved personnel and equipment around the fleet.

Other Navy fixed-wing assets included the Lockheed P-3 Orion maritime patrol aircraft and its EP-3E intelligence-gathering version, while C-130 variants and the Douglas C-9 transport were also in demand.

Carrier Air Wing

Each carrier air wing generally comprised two fighter squadrons of F-14 Tomcats, two light-attack squadrons of F/A-18 Hornets or A-7 Corsairs, one or two attack squadrons of A-6E Intruders, an E-2 Hawkeye early warning squadron, an EA-6B Prowler jamming squadron,

an S-3 Viking anti-submarine squadron and an SH-3H Sea King squadron for utility, plane guard and search and rescue duties. Of the Tomcat squadrons, the second would normally have at least two aircraft configured for reconnaissance with TARPS, while many of the A-6 squadrons included a handful of KA-6D Intruder tankers.

The Navy's carrier aircraft flew the full gamut of missions and delivered weapons unique among the Coalition, including the AGM-64E and AGM-62 missiles. Its Hornets downed a pair of MiG-21 *Fishbeds*, while the Tomcats accounted for an Iraqi helicopter. At least seven aircraft were lost in combat, including two F/A-18s, four A-6Es and an F-14A(Plus). ❖



A load of six 1,000lb bombs suggests that range was not of primary importance for this *Saratoga* F/A-18C. *Wikimedia Commons*



The F-14 possessed considerable deck presence, as this F-14A(Plus) demonstrates. Post-war the Plus became the F-14B and Tomcat crews soon found themselves taking on a new attack role. *Wikimedia Commons*



With the jet blast deflector raised, a VA-35 A-6E prepares for a catapult launch at the start of another Desert Storm sortie. *Senior Airman Chris Putnam/DoD*



A VA-72 A-7E leaves *JFK's* deck bound for an Iraqi target with four 1,000lb bombs. *Senior Airman Chris Putnam/DoD*



This was *JFK* during Desert Shield. Two of its VS-22 S-2B Vikings are parked upper left.
PH2 Charles W Moore/US Navy



In this formation up from *JFK*, a VA-75 A-6E is flying as a buddy tanker for four VA-46 Corsairs. TSgt Rose Reynolds/USAF



▼ The US Navy was also responsible for firing BGM-109 Tomahawk cruise missiles – this one was launching off USS *Mississippi*. MMCS Henderlite/US Navy



DESERT STORM CARRIER DISPOSITION

SHIP	LOCATION	TAILCODE	EMBARKED UNITS	TYPE
<i>Midway</i>	Persian Gulf	NF	VFA-151	F/A-18A
			VFA-192	F/A-18A
			VFA-195	F/A-18A
			VA-115	A-6E
			VFA-185	A-6E/KA-6D
			VAW-115	E-2C
			EAQ-136	EA-6B
			HS-12	SH-3H
<i>Ranger</i>	Persian Gulf	NE	VF-1	F-14A
			VF-2	F-14A
			VA-145	A-6E/KA-6D
			VA-155	A-6E
			VAW-116	E-2C
			EAQ-131	EA-6B
			VS-38	S-2A
			HS-14	SH-3H
<i>Saratoga</i>	Red Sea	AA	VF-74	F-14A(Plus)
			VF-103	F-14A(Plus)
			VFA-81	F/A-18C
			VFA-83	F/A-18C
			VA-35	A-6E/KA-6D
			VAW-125	E-2C
			EAQ-132	EA-6B
			VS-30	S-2B
<i>America</i>	Red Sea	AB	HS-3	SH-3H
			VF-33	F-14A
			VF-102	F-14A
			VFA-82	F/A-18C
			VFA-86	F/A-18C
			VA-85	A-6E/KA-6D
			VAW-123	E-2C
			EAQ-137	EA-6B
<i>John F Kennedy</i>	Red Sea	AC	VS-32	S-2B
			HS-11	SH-3H
			VF-14	F-14A
			VF-32	F-14A
			VA-46	A-7E
			VA-72	A-7E
			VA-75	A-6E/KA-6D
			VAW-126	E-2C
<i>Theodore Roosevelt</i>	Red Sea	AJ	EAQ-130	EA-6B
			VS-22	S-2B
			HS-7	SH-3H
			VF-41 F-14A	F-14A
			VF-84	F/A-18A
			VFA-115	F/A-18A
			VFA-87	F/A-18A
			VA-36	A-6E
			VA-65	A-6E/KA-6D
			VAW-124	E-2C
			EAQ-141	EA-6B
			VS-24	S-2A
			HS-9	SH-3H



The arrestor hook of a VAW-125 Hawkeye reaches for the wire as it traps back aboard *Saratoga*.

Wikimedia Commons



FRANCE

Both the French Army and Air Force committed Puma helicopters to Desert Storm. TSgt HH Deffner/USAF

French Air Force and Army units contributed air defence, attack, reconnaissance and helicopter capability to the Coalition, as well as providing tanker and transport support. Thomas Newdick reports

The French government was swift to respond to the Iraqi invasion of Kuwait and initially set about strengthening its military presence in Djibouti, across the waters of the Gulf of Aden. French Air Force (FAF) Transall C.160 tankers were soon on hand to support the Mirage F1Cs already based in Djibouti, where they were stationed alongside Aerospatiale Alouette IIs and additional Transall airlifters.

On August 13, 1990 a French military contingent set sail for Djibouti aboard the carrier *Clemenceau*, which embarked 30 Aerospatiale Gazelles and 12 Aerospatiale Pumas from the French Army, as part of Operation Salamandre. On September 9, the first French Army helicopters arrived at Yanbu, Saudi Arabia, having been airlifted by Transall, C-130 and Air France freighters. Before the end of the month, the helicopters shipped by *Clemenceau* had also been unloaded at Yanbu.

By September 26, a force of 48 French Army helicopters was at King Khalid Military City (KKMC), Saudi Arabia. Here, the French rotary-winged contingent was steadily built up, receiving another 20 Gazelles and four Pumas on October 31, and another batch of 40 helicopters once the war had begun.

Operation Daguet

On September 14, France elected to send combat aircraft to the Gulf, prompting the French Air Force to launch Operation Daguet. The first French jets to arrive in Saudi Arabia were eight Mirage 2000Cs and four Mirage F1CRs, which had departed Istres with tanker support on October 3. Another four Mirage 2000Cs and four Mirage F1CRs soon joined them at Al Ahsa,

followed by two batches of four SEPECAT Jaguar As, two FAF Pumas for combat search and rescue (CSAR), and a C.160G Gabriel electronic intelligence (Elint) aircraft.

When the UN deadline for the Iraqi withdrawal from Kuwait expired, the FAF contingent at Al Ahsa comprised 24 Jaguars, 12 Mirage F1CRs, 12 Mirage 2000Cs, two Pumas and a Gabriel. Support assets at Riyadh included five C-135FR tankers, five Transalls, and a Dassault Mystère 20 and a Nord 262 for liaison.

The Mirage 2000Cs flew their first combat air patrols on December 12, while the Mirage F1CRs soon embarked on reconnaissance missions using their side-looking radar to 'peer' over the Saudi border at Iraqi forces.

On October 17, eight Mirage F1CRs deployed to Doha, Qatar, where they bolstered local air defence in 150 sorties.

Combat Operations

The Jaguars began flying offensive missions on January 17, 1991 and the type was initially used for battlefield air

interdiction sorties over Kuwait, before pushing on into Iraqi airspace on January 24. With this move, the Jaguars began targeting strategic objectives, including bridges. French Jaguars flew 615 sorties during Desert Storm, in the course of which one aircraft was badly damaged by a SAM.

The Mirage F1CR joined the fight somewhat later, launching mixed sorties with the Jaguars on January 26. The F1CRs eventually recorded 114 Desert Storm sorties without loss. After flying further combat air patrols over Saudi Arabia, the Mirage 2000Cs only joined the Coalition order of battle on February 6.

Based at King Khalid International Airport in Riyadh, the FAF C-135FRs refuelled national assets and supported US Navy F-14s and a single EA-6B during the campaign. In all, French Stratotankers offloaded 1,693 tonnes of fuel before returning to France in March.

In the course of their war, French Army Gazelles fired 187 HOT missiles against Iraqi targets. ❖

SSgt Lee F Corkran/USAF



French Mirage F1CRs share Qatari ramp space with 614th TFS F-16s during Desert Storm.



This tanker's bulbous engine nacelles identify it as a KC-135R. Installing F108 turbofans (the military variant of the CFM56 commercial engine) dramatically improved the KC-135's fuel offload capabilities. SSgt Lee Corkran/USAF

EC-135, KC-135, RC-135 AND C-137

Already a veteran when Iraq invaded Kuwait, the KC-135 rose to the challenge and returned a war-winning performance. The EC and RC variants of the C-135 airframe also played significant roles

In 1954 Boeing flew its Model 367-80, or Dash 80, the prototype of a new generation, swept wing jet transport. Although the aircraft's fuselage was too narrow for the airlines, obliging Boeing to redesign it, the USAF ordered a developed version as the C-135, known to the manufacturer as the Model 717.

Thus the Dash 80 seeded two lines of evolution, the Model 717 leading to the C/EC/KC/RC-135 series of military aircraft and the wider Model 707, designed for commercial use, which entered USAF service in small numbers from 1959 as the C-137. Both lines found roles over the Gulf in 1990/91.

KC-135 Stratotanker

By far the most significant numerically, the KC-135 initially refuelled tactical aircraft deploying into theatre, but soon began support missions from bases in the Gulf. Pressed into service as a transport, it also helped relieve the USAF's Military Airlift Command.

Stratotankers based in Europe, including a provisional wing in France, continued to support incoming aircraft, as well as B-52G raids out of the UK and Spain. Operations over Iraq were generally restricted to well established refuelling tracks, but crews occasionally

ventured into Iraqi airspace to meet tactical aircraft critically low on fuel.

Contemporary reports suggest that in excess of 250 KC-135s of all models were in the Gulf region for Desert Storm, although it seems probable that all of the 600 plus aircraft in the fleet were involved at some point.

The original J57 turbojet-engined KC-135A was still an important asset, although the re-engined KC-135E (JT3D) and KC-135R (F108) were dominant. The KC-135Q, originally developed to support the SR-71 'Blackbird', with additional navigation aids and means of covert communication, was also employed over the Gulf. The 'Q' later became a specialist in tanking the F-117 and may have taken this role during Desert Shield and Desert Storm.

Rivet Joint

A dedicated electronic warfare platform operated by the 55th Strategic Reconnaissance Wing, home based at Offutt AFB, Nebraska, the RC-135 Rivet Joint provided vital intelligence on Iraqi communications and radar emissions prior to and during combat operations. Detachments at Riyadh and Hellenikon, Greece flew the aircraft on its long missions in theatre.

BOEING KC-135E STRATOTANKER

- **Powerplant:** four Pratt & Whitney JT3D-3B turboprops each rated at 18,000lb (80.07kN) thrust
- **Performance:** maximum level speed at high altitude 530kt (982km/h), service ceiling 45,000ft (13,715m), operational radius 1,000nm (1,854km) to offload 120,000lb (54,432kg) of fuel
- **Dimensions:** wing span 130ft 10in (39.88m), length 136ft 3in (41.53m), height 41ft 8in (12.70m), wing area 2,433sqft (226.03m²)
- **Weights:** operating empty 106,306lb (48,220kg), maximum take-off 316,000lb (143,335kg), maximum payload 83,000lb (37,650kg)

The first Rivet Joint in the region arrived on August 4, 1990, just two days after Iraq invaded Kuwait. It immediately established the template for the intense round of missions to come, many of which lasted up to 24 hours. Such was the pace of operations that aircraft and crews were regularly rotated back to Nebraska for maintenance and rest, while the latest RC-135U, V and W Rivet Joint variations were exclusively employed.

During Desert Shield, Rivet Joints →

KC-135Rs massed at a theatre airfield during Desert Shield. DoD



DEPLOYMENT

UNIT

807th Air Refueling Wing (Provisional)
1702nd Air Refueling Wing (Provisional)
1703rd Air Refueling Wing (Provisional)
1706th Air Refueling Wing (Provisional)
1707th Air Refueling Wing (Provisional)
1708th Air Refueling Wing (Provisional)
1711th Air Refueling Wing (Provisional)
1712th Air Refueling Wing (Provisional)
1713th Air Refueling Wing (Provisional)

MODEL

KC-135R
KC-135R
EC-135L; KC-135A & R
KC-135E
KC-135R
KC-135A & E
KC-135A & Q
KC-135E & R
KC-135E

BASE

Mont-de-Marsan, France
Muscat-Seeb, Oman
Riyadh/King Khalid International Airport, Saudi Arabia
Cairo West Airport, Egypt
Masirah, Oman
Jeddah/King Abdul Aziz International Airport, Saudi Arabia
Riyadh/King Khalid International Airport, Saudi Arabia
Abu Dhabi International Airport, UAE
Dubai International Airport, UAE



The 'Team Recce' patch, featuring U-2, KC-135 and SR-71, on this KC-135Q co-pilot's sleeve, hints at the aircraft's specialist capabilities. TSgt Hans Deffner/USAF



The nose radome, cheek fairings and multiple fuselage antennas identify this aircraft as an RC-135. It was up for a Desert Shield mission and approaching a KC-135 for fuel; inflight refuelling was an essential tool in the Rivet Joint's long-endurance work. TSgt Hans Deffner/USAF



A KC-135A demonstrates the type's characteristically smoky take-off, during Desert Storm. DoD

French Tankers

France originally acquired the KC-135 as the C-135F, to support its Mirage IV bomber fleet. Upgraded under the programme that produced the USAF's KC-135R, the 11 surviving aircraft were raised to KC-135FR standard.

An initial two machines arrived at King Khalid on October 15, 1990 and a fleet of ten was in place during Desert Storm. The aircrafts' primary recipients were French Jaguars, and Mirage 2000s and F1s, but US Navy F-14 Tomcats and an EA-6B Prowler were also customers.



For compatibility with probed receivers the KC-135 was fitted with a hose and drogue attachment for its refuelling boom. A less than ideal solution, it enabled the aircraft to fuel US Navy types and many other Coalition warplanes, but denied its boom to USAF machines. CMSgt Don Sutherland/USAF



This VC-137 was busy during Desert Storm, bringing Secretary of State Richard Cheney and Chairman Joint Chiefs of Staff, General Colin Powell together for a meeting in-theatre. TSgt Rose Reynolds/USAF



◀ The KC-135 proved a popular canvass for nose art. A suitably seasonal design graced this KC-135 for its return to the 9th SRW at Beale AFB, California carrying Christmas mail during Desert Shield. TSgt Hans Defner/USAF

► QUANAHPARKER was another of many KC-135's with nose art. DoD



often worked in co-ordination with Coalition fighters, which flew at speed towards the Iraqi border, before turning away as late as possible. The inevitable bursts of activity from Iraqi communications and radar facilities produced emissions that the RC-135 collected and in some cases analysed, before they were added to the electronic order of battle.

At least one Rivet Joint remained airborne throughout Desert Storm, 'sniffing' for emissions and helping guide strikers and other Comint platforms against particular targets. It was also down to the RC-135 that the effectiveness of the F-4G Phantom was demonstrated,

since Rivet Joint operators noted widespread shutting down of radars whenever the Weasels were in the air.

EC-135L

Least numerous of the C-135 variants flown against Iraq, two EC-135Ls from the 305th ARW at Grissom AFB, Indiana flew under the 1703rd ARW(P). Usually employed to relay secure launch and control communications for SAC's Minuteman nuclear missile sites, the aircraft were deployed to facilitate comms between satellites and local ground stations.

The effort was important for the timely passing and processing of information

in the campaign against mobile Scud launchers. When the EC-135Ls returned to Nebraska on March 7, 1991, both wore Scud mission marks.

VC- & CC-137

The USAF's small fleet of VC-137 transports enabled the rapid, secure movement of senior military and political leaders back and forth between the US and the Gulf region, as well as within the area of operations.

Canada also operated a Boeing 707 variant within the Coalition, basing one of two 437 Sqn CC-137 tanker/transports at Doha, Oman for inflight refuelling with its CF-188 force. ❖



By far the best equipped of the Arab coalition air arms, the RSAF flew border patrols and mounted a credible air defence of Saudi Arabia with its F-15C and Tornado fleets. This Eagle was preparing to take fuel from a 1700th ARS KC-135 during Desert Shield.

TSgt HH Deffner/USAF

ARAB COALITION

Arab participation was vital to the success of the US-led Coalition. As Thomas Newdick explains, Bahrain, Qatar and the UAE all added warplanes to join the effort alongside those of Kuwait and Saudi Arabia

When Iraqi forces invaded Kuwait they faced opposition from the Kuwait Air Force (KAF). After putting up initial resistance in the face of overwhelming superiority, elements of the KAF escaped to Bahrain and Saudi Arabia. Remustered in Saudi Arabia, they were reconstituted as the Free Kuwait Air Force.

The spearhead of the force comprised 18 Dassault Mirage F1CK interceptors and 20 Douglas TA/A-4KU fighter-bombers, alongside armed BAe Hawk Mk 64 jet trainers. In practice, the Mirages and Hawks saw little use, and it was left to the Skyhawks to continue the fight to liberate their country. The Royal Saudi Air Force (RSAF) took administrative control of the Kuwaiti contingent, while French technicians provided maintenance support.

Kuwaiti A-4s saw considerable action from the outset of the Coalition air operation, flying hazardous daylight missions, in the course of which one aircraft was lost (in the first such sortie, flown on January 17).

Further strikes were flown by Kuwaiti Gazelle helicopters, armed with High subsonic, Optically-guided, Tube-launched (HOT) missiles.

Royal Saudi Air Force

The most powerful of the Arab coalition air arms, the RSAF was bolstered by the arrival of 24 F-15Cs from USAF stocks and these, together with Tornado ADVs, flew standing air patrols from Dhahran, beginning in mid-August 1990 and continuing until after the end of hostilities.

In the process, the RSAF scored two aerial victories: on January 24, 1991, F-15 pilot Capt al-Shamrani of No. 13 Sqn used two AIM-9s to down a pair of Iraqi Mirage F1EQs thought to be attempting an anti-shipping attack with Exocet missiles. On the negative side, an RSAF F-15 was lost in a training accident on February 13.

Additional RSAF assets made available to the Coalition included Northrop F-5E Tiger II ground-attack aircraft and reconnaissance-configured RF-5Es at Tabuk, and Tornado IDS strike aircraft that flew from Dhahran. The Tornados commenced missions against Iraqi airfields on the night of January 17/18, 1991 and one of their number was lost in a non-combat mishap.



Established at Dhahran under RSAF control, Kuwait's surviving A-4KU Skyhawks mounted their Desert Shield and Storm campaigns in 'Free Kuwait' titles. *Sgt Jeff Wright/USAF*



A Qatari pilot prepares for a Desert Storm mission in his Mirage F1. The aircraft is armed with a single bomb, but also mounts powerful internal cannon. Mirage F1 operations were carefully orchestrated for fear of confusion with similar Iraqi jets. *SSgt Lee F Corkran/USAF*



The UAE's Desert Storm contribution included tactical reconnaissance collected by the Mirage 2000RAD. The aircraft's mission sensors were housed in a large underfuselage pod. *TSgt Perry Heimer/USAF*



Saudi Arabia's Tiger II fleet included the two-seat F-5F conversion trainer. *TSgt Rose S Reynolds/USAF*

Hawk Mk 65s, stationed at Dhahran, flew light attack missions, while anti-shipping strikes were the preserve of Aerospatiale AS565SA Panthers, based at Al Jubail. Armed with AS15 missiles, they sank five Iraqi patrol boats between January 30 and February 3.

Bahrain, Qatar, UAE

The Bahrain Amiri Air Force performed its first Coalition missions on January 25, when F-5Es flew a defensive air patrol from Sheikh Isa AB. The following day, the Bahraini Tiger IIs flew their first offensive sorties.

The Qatar Emiri Air Force provided its Doha-based Mirage F1EDA force to the Coalition from January 22. These fighters are understood to have flown local air defence missions and may also have struck Iraqi targets in Kuwait.

Completing the Arab air coalition was the United Arab Emirates Air Force (UAEAF), which launched missions in support of Operation Desert Storm on February 19. For this purpose, its Mirage 2000EADs operated from Al Dhafra, providing local air defence with the support of French technicians. The UAEAF also supported the Coalition intelligence-gathering effort with its dedicated Mirage 2000RAD reconnaissance aircraft. ❖



▲ Among many types playing minor roles in the conflict, the UAE supplied this CASA C.212 Aviocar. Here the aircraft was employed moving Ambassador Walker, the US ambassador to the UAE, and his entourage, during Desert Shield. *MSgt Jose Lopez/USAF*



◀ The RSAF operated Tornado ADV (roughly equivalent to the RAF's Tornado F3) and IDS (GR1) aircraft. Here a heavily loaded ADV launches for a Desert Shield sortie. *TSgt HH Deffner/USAF*

Uniquely configured to survive over a central European Cold War battlefield, the A-10 proved devastating over Kuwait and Iraq. Sidewinders were typically carried on the port outer pylon, balanced by an ECM pod – here an ALQ-119 – to starboard. *TSgt HH Deffner*

A-10 THUNDERBOLT II

Considered ripe for retirement before Desert Shield, the A-10 turned in one of the finest performances of the war, in the precarious low-level anti-armour role

Working under the threat of their aircraft being retired, the Fairchild Republic A-10 Thunderbolt II community deployed en masse to Saudi Arabia, creating a force of approximately 200 warplanes that was second in numbers only to the F-16. Designed for a low-level anti-armour role over the European battlefield, the A-10 was slow and of unconventional configuration, its awkward looks earning the popular appellation 'Warthog'.

For many years doubters in the A-10's ability to survive at low level by evasion had pressed for its withdrawal and the demands had seldom been stronger than in early 1990. Yet the A-10 was an early arrival in theatre, where Iraqi armour was expected to prove a major obstacle to Coalition victory.

Warthog operations in Kuwait began early in the campaign, the aircraft taking on Iraqi vehicles and air defence targets with immediate success. They were more heavily engaged after the ground war opened on February 24, refuelling and rearming at forward operating locations (FOLs) established in the desert, as well as their main operating base at King Fahd AB, Taif, Saudi Arabia.

On February 25, Republican Guard units moved to engage British, French and US armoured columns thrusting into Iraq, but their vehicles attracted the attentions of anti-tank helicopters and A-10s as soon as they emerged from hiding. The Warthog crews found a

target-rich environment where they made maximum use of their AGM-65 Maverick missiles and the A-10's unique GAU-8/A Avenger cannon.

The day's intensive action saw two A-10 pilots, Captain Eric Solomonson and Lieutenant John Marks, fly three sorties, the first against an advancing Iraqi column. They used Mavericks to destroy six tanks and took two more out with their guns, before recovering to a FOL. Off again, they raced to relieve US Marines in contact near Kuwait City, where an AV-8B had been downed and a second damaged. Soon, another six tanks had taken Mavericks and two more had fallen to the gun.

Solomonson and Marks flew back to King Fahd only to be launched again, this time to assist Marines on the very outskirts of Kuwait City. With another seven tanks destroyed, the pair returned to base with an impressive total for the day of 23 tanks killed.

Other Roles

Designated OA-10A as forward air control (FAC) platforms, the Warthogs on strength with the 23rd Tactical Air Support Squadron (TASS) were in fact standard aircraft, although their pilots were trained to operate as airborne FACs. They worked closely with their A-10 colleagues and the entire A-10 force operated in co-operation with Coalition anti-tank helicopters as a matter of course.

Given its manoeuvrability and loitering

capability, the A-10 also proved a useful RESCAP (rescue combat air patrol) asset. Two jets flew RESCAP for a Tomcat crew on January 21.

The A-10's low level role over the battlefield inevitably placed it into harm's way and four aircraft were lost, two each of the A-10A and OA-10A. To their credit, the 194 aircraft deployed destroyed in the region of 1,000 tanks, 2,000 armoured personnel carriers and artillery pieces, 1,400 vehicles, 190 air defence radars and 100 SAM sites. ♦



This 23rd TFS pilot was just back from a Desert Storm mission.

Sgt Trambue Prentes/DoD



FAIRCHILD REPUBLIC A-10A THUNDERBOLT II

- **Powerplant:** two General Electric TF34-GE-100 turbofans each rated at 9,065lb (40.32kN) thrust
- **Performance:** maximum level speed 'clean' at sea level 381kt (706km/h)
- **Dimensions:** wing span 57ft 6in (17.53m), length 53ft 4in (16.26m), height 14ft 8in (4.47m), wing area 506sqft (47.01m²)
- **Weights:** operating empty 24,959lb (11,321kg), maximum take-off 50,000lb (22,680kg), maximum stores load 16,000lb (7,258kg)

▲ Specialist kit was moved into theatre to load the GAU-8/A Avenger cannon. Firing 30mm shells with depleted uranium warheads, the gun was hugely effective against Iraqi armour. *Sgt Trambue Prentes/DoD*

A-10 THUNDERBOLT II DEPLOYMENT

UNIT	MODEL
10th Tactical Fighter Wing, RAF Alconbury, UK 511th TFS	A-10A
23rd Tactical Fighter Wing, England AFB, Louisiana 74th TFS, 75th TFS, 76th TFS	A-10A
354th Tactical Fighter Wing, Myrtle Beach AFB, South Carolina 353rd TFS, 355th TFS	A-10A
926th Tactical Fighter Group, NAS New Orleans, Louisiana 706th TFS	A-10A
602nd Tactical Air Control Wing, Davis Monthan AFB, Arizona 23rd TASS	OA-10A



▲ Maverick was always the A-10's primary anti-armour weapon. In a European scenario, the GAU-8/A was especially useful against ZSU-23 AAA systems, since its rounds were more likely to penetrate the weapon's hemisphere of fire than a missile.

Sgt Trambue Prentes/DoD

◀ Sidewinders, Mavericks and cluster bombs combine to give this A-10 considerable flexibility. Warhogs downed two helicopters air-to-air, both, ironically, with the cannon, scoring the only gun kills of the conflict.

TSgt Fernando Serna/DoD

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Royal Air Force crews were prolific in their application of nose art, no more so than on the Jaguar. Here XZ364 'Sadman' leads as two aircraft launch for a Desert Storm mission. They have the standard ALQ-101 ECM pod under their port wings (with a Phimat chaff pod to starboard) and pairs of Rockeyes on their inboard pylons. RAF (AHB)/© UK MoD Crown Copyright 2016



JAGUAR

A stalwart of British and French low-level attack, the Jaguar turned in an impressive Desert Storm performance, albeit from medium altitude and, in the case of the RAF jets, with new weapon systems

Designed through Anglo-French co-operation, it was fitting that the SEPECAT Jaguar should form a significant component of the French and UK contributions to Desert Storm. The Jaguars were generally assigned battlefield air interdiction missions, but coastal and air defence targets were also struck with considerable success.

Leaving their Coltishall, Norfolk base for Thumrait, Oman on August 11, 1990, the RAF 'Jags' moved to Muharraq, Bahrain in October and remained there for the Desert Storm campaign. France based its Jaguars at Al Ahsa, Saudi Arabia, despatching its first aircraft to theatre on October 15.

The RAF's 12 Jaguar GR.Mk 1A jets concentrated primarily on targets in and off Kuwait, including a 1,120-tonne *Polnocheny-C* landing craft sunk by CRV-7 rocket and 30mm ADEN cannon fire on January 30. The Canadian-developed CRV-7 proved particularly effective. A 70mm projectile, it reached Mach 4 soon after launch and was accurate over more than 19,500ft (6,000m).

The rocket's hurried integration onto the aircraft initially proved less than successful and it was withdrawn for two

weeks while software was re-written. Its return to service was spectacular, although its absence had enabled the RAF to introduce another new weapon to the Jag's inventory, the devastating US CBU-87 Rockeye II cluster bomb.

The RAF's own BL755 cluster bomb was optimised for low-level delivery

and since Desert Storm tactics quickly demanded medium altitude work, it was less than satisfactory. The US bomb was ideal, however, as was CRV-7. The GR1As also flew with overwing Sidewinders and countermeasures pods for self defence.

Provision of BAe and Vinten VICON

US and RAF groundcrew work together to refuel British Jaguars.

TSgt Rose Reynolds/USAF





A Jaguar waits for a Tornado to finish topping off, before taking its fill from an RAF VC10. RAF (AHB)/© UK MoD Crown Copyright 2016

reconnaissance pods for two aircraft enabled the RAF's Jaguars to collect intelligence that directly benefitted their own operations. In a little over 600 combat sorties the Jags released more than 1,000 bombs, fired 608 CRV-7s and 9,600 rounds of 30mm.

French Jags

France sent 28 Jaguar A warplanes to Saudi Arabia and initially restricted them to targets in Kuwait for political reasons.

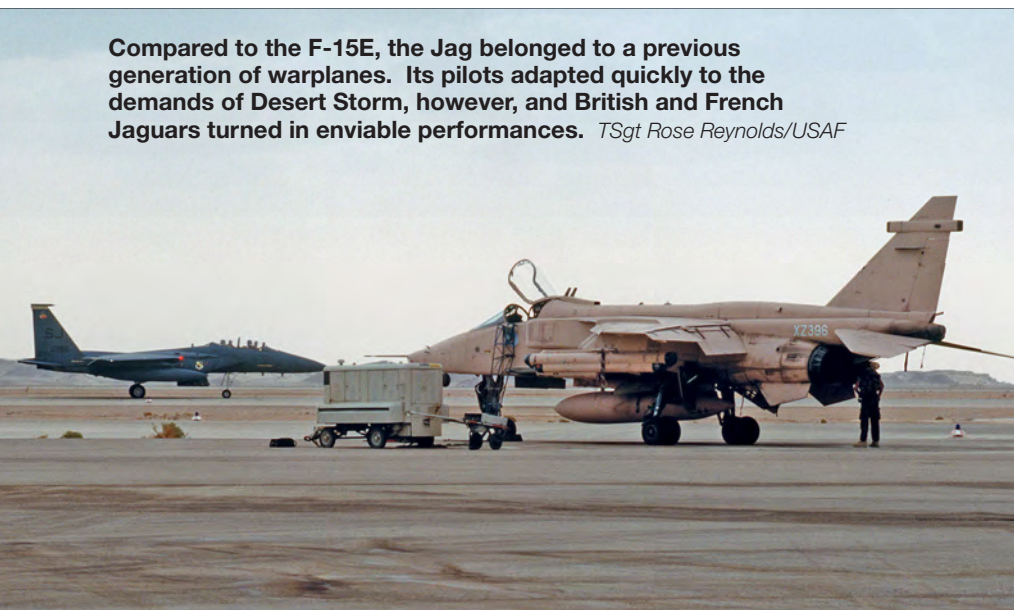
Missions into Iraq were permitted from January 24, after a French government reshuffle. Provision of the Automatic Tracking Laser Illumination System (ATLIS) pod enabled the Jaguar A to deliver the laser-guided AS30L missile as an alternative to 'dumb' bombs, delivering a precision capability denied to the RAF aircraft.

Unfamiliarity with the weapon initially denied the Jaguar pilots success, but they quickly adapted and around 80% of

the AS30Ls expended scored direct hits. Like the RAF, the French soon moved to medium-altitude operations where their Belouga cluster bomb was less effective, obliging them to use 'iron' bombs.

The French flew a similar number of sorties to their British counterparts, both forces suffering a degree of battle damage, although the Jaguar As were less fortunate when one aircraft was so badly damaged by a SAM that it was withdrawn back to France as airfreight. ❖

Compared to the F-15E, the Jag belonged to a previous generation of warplanes. Its pilots adapted quickly to the demands of Desert Storm, however, and British and French Jaguars turned in enviable performances. TSgt Rose Reynolds/USAF



SEPECAT JAGUAR GR.MK 1A

- **Powerplant:** two Rolls-Royce Turbomeca Adour Mk 104 turboprops rated at 8,040lb (35.75kN) thrust with afterburning
- **Performance:** maximum level speed at 36,000ft (10,975m) 917kt (1,699km/h), service ceiling 45,930ft (14,000m), combat radius on a hi-lo-hi attack mission with internal fuel 460nm (852km)
- **Dimensions:** wing span 28ft 6in (8.69m), length 55ft 2½in (16.83m), height 16ft ½in (4.89m), wing area 260.27sqft (24.18m²)
- **Weights:** empty equipped 16,975lb (7,700kg), maximum take-off 34,612lb (15,700kg), maximum stores load 10,000lb (4,536kg)



AV-8B HARRIER II

The Harriers flew their Desert Storm missions from Al Jubail and, in the case of VMA-331, off USS *Nassau*. Here the ship was launching a Desert Shield training exercise. PH1(AC) Scott M Allen/USN

The US Marine Corps Harrier fleet had a busy war, supporting Marines on the ground and engaging Iraqi artillery and tanks

Intended to deliver close air support (CAS) over the beachhead and just beyond, flying off amphibious assault ships and from forward operating locations ashore, the McDonnell Douglas/BAe AV-8B Harrier II performed relatively little of its traditional role during Desert Storm. The US Marine Corps moved 88 Harriers into theatre for the war, the last of them arriving from Japan after a two-week odyssey that saw them ferry via the US in five long 'hops'.

Early plans envisaged the jets flying CAS for the Marines as they moved through Kuwait, or during an amphibious landing,

but in the event the Harrier was active from the outset. On that first day artillery pieces shelling troops at Khafji were silenced, the Harriers working with a forward air controller (FAC) in an OV-10 Bronco.

Using mostly cluster munitions and 'iron' bombs, the Harriers conducted a majority of battlefield air interdiction missions, initially operating at medium level, but flying lower as more CAS calls came in. They flew 3,380 sorties, losing four aircraft to ground fire, missions including burning oil from Iraqi defensive trenches and using fuel-air explosive against minefields. ❖



Five squadrons provided Harriers for Desert Storm, VMA-231, 311, 331, 513 and 542. Up for a Desert Shield mission, these jets were from VMA-513. SSgt Scott Stewart/USAF



Nassau lost one of its Harriers to a SAM. In combat the jets operated alongside the ship's AH-1W Cobras. PH1(AC) Scott M Allen/USN

MCDONNELL DOUGLAS/BAE AV-8B HARRIER II

- **Powerplant:** one Rolls-Royce F402-RR-406A turbofan rated at 21,450lb (95.42kN) thrust
- **Performance:** maximum level speed 'clean' at sea level 575kt (1,065km/h), service ceiling more than 50,000ft (15,240m), combat radius 594nm (1,001km) with seven 500lb bombs and two 300US gal (1,136-litre) drop tanks after a short take-off
- **Dimensions:** wing span 30ft 4in (9.25m), length 46ft 4in (14.12m), height 11ft 7¼in (3.55m), wing area 238.70sqft (22.18m²)
- **Weights:** operating empty 13,968lb (6,336kg), maximum take-off 31,000lb (14,061kg), maximum stores load 10,800lb (4,899kg)

A/KA-6 INTRUDER & EA-6B PROWLER

Serving the US Navy and Marine Corps at sea and from shore bases, the A-6E Intruder and its EA-6B Prowler electronic warfare derivative were primary naval combat platforms



The TRAM turret under the nose of this VA-75 Intruder is just visible. The unit flew off USS John F Kennedy for Desert Storm. DoD



▲ Prowler (foreground) and Intruder await their next missions in this busy Desert Storm scene aboard JFK. The LGBs on trolleys and under the A-6's wings are awaiting final assembly. PH2 Lipski/US Navy

► The drogue stowed prominently under the centre fuselage served an air-to-air refuelling hose and identifies this aircraft as a KA-6D. It flew with VA-35 off Saratoga during Desert Shield. SSgt Lee F Corkran/USAF

Another type with its origins in the 1950s and reaching the end of a busy career, the Grumman A-6 Intruder was the standard US Navy and USMC medium attack aircraft. Both services employed the latest A-6E TRAM (Target Recognition Attack, Multisensor) aircraft in Desert Storm, equipped with an undernose turret containing forward-looking infrared and laser designation equipment.

The Marines flew two squadrons of A-6Es from Bahrain in direct support of ground troops, while the large Navy A-6 fleet flew off *America*, *Eisenhower*, *Independence*, *JFK*, *Midway*, *Ranger*, *Saratoga* and *Theodore Roosevelt*. Although it dropped large numbers of

unguided weapons, the A-6E TRAM was compatible with a wide range of guided weapons, including LGBs, which were used extensively.

Perhaps most significantly, the US Navy launched seven AGM-84E Stand-off Land Attack Missiles (SLAMs) from its A-6Es. A cruise missile derivative of the AGM-84 Harpoon anti-ship weapon, SLAM was employed at an early stage in its development cycle.

The Intruder squadrons also included a scattering of KA-6D tankers within their ranks. The KA-6D could accompany strike packages or remain closer to the carrier, usefully extending the endurance of its fighter cover.

GRUMMAN A-6E INTRUDER

- **Powerplant:** two Pratt & Whitney J52-P-8B turbojets each rated at 9,300lb (41.37kN) thrust
- **Performance:** maximum level speed at sea level 560kt (1,037km/h), service ceiling 42,400ft (12,925m), range with maximum military load 878nm (1,627km)
- **Dimensions:** wing span 53ft (16.15m), length 54ft 9in (16.69m), height 16ft 2in (4.93m), wing area 528.90sqft (49.13m²)
- **Weights:** empty 27,613lb (12,525kg), maximum take-off for catapult launch 58,600lb (26,580kg), maximum stores load 18,000lb (8,165kg)

GRUMMAN EA-6B PROWLER

- **Powerplant:** two Pratt & Whitney J52-P-408 turbojets each rated at 11,200lb (49.80kN) thrust
- **Performance** (with five jamming pods): maximum level speed at sea level 530kt (982km/h), service ceiling 38,000ft (11,580m), range 955nm (1,769km)
- **Dimensions:** wing span 53ft (16.15m), length 59ft 10in (18.24m), height 16ft 3in (4.95m), wing area 528.90sqft (49.13m²)
- **Weights:** empty 31,572lb (14,321kg), normal take-off for catapult launch with five jamming pods 54,491lb (24,703kg)



Prowler

Coalition success was in a large part down to an extensive jamming and SEAD effort, within which the EA-6B Prowler was a primary player. Based on the A-6A, but revised to seat a crew of pilot and three electronic countermeasures officers, the EA-6B's extensive mission suite included the podded ALQ-99 jamming system.

Up to five pods could be carried, but capacity was usually sacrificed to enable one or two HARMs per aircraft. Every carrier had a Prowler squadron, while a squadron of USMC jets was based at Sheikh Isa, from where they initially helped assess the Iraqi electronic order of battle.

At least four US Navy A-6Es were lost to ground fire. ❖



UNITED KINGDOM

Small by comparison with that of the US, the UK nevertheless contributed a highly effective air power package to Desert Storm

The UK's response to Iraq's invasion of Kuwait was extremely rapid. Operation Granby was declared as the codename for all activities relating to the Gulf deployment and the first Tornado F.Mk 3 fighters arrived at Dhahran, Saudi Arabia, on August 11. Numbers 5 and 29 Squadrons had been at Cyprus on a regular training detachment and moved their aircraft to Saudi rather than back home to RAF Coningsby.

While the RAF air transport fleet began a hectic schedule of movements back and forth between its bases at RAF Brize Norton, Oxfordshire and Lyneham, Wiltshire, the Jaguar attack aircraft arrived in theatre, eventually settling at Muharraq, Bahrain. The same base soon took a squadron of Tornado GR.Mk 1 bombers and as the force continued to build, similar units were established at Dhahran and Tabuk; a small GR.Mk 1A reconnaissance cadre also called Muharraq home.

Britain's fast jet presence was completed when Buccaneers arrived in Bahrain to designate, or 'lase', for LGBs carried by Muharraq's Tornados. The first joint mission occurred on February 2 and three days later the Buccs began working with Dhahran's 'Tonkas'. The Tabuk Tornado contingent received the TIALD pod, then barely out of development, for its lasing requirements.

Riyadh found space for the RAF's Hercules detachment, which included a pair of RNZAF machines, as well as its VC10 tankers. When a TriStar K.Mk 1 was in theatre, this too resided at the Saudi



Airfield security also fell under the RAF's remit, Regiment squadrons setting up Rapier air defence batteries, including this one at Muharraq. RAF (AHB)/© UK MoD Crown Copyright 2016

base. The RAF also maintained a BAe 125 presence at Riyadh, for liaison and rapid transport missions not unlike those of the USAF's C-21A.

The Victor tanker and Nimrod completed the UK's fixed-wing contribution to Desert Shield and Storm. The former settled at Muharraq, while the Nimrod MR.Mk 2P maritime patrol jets were stationed at Seeb, Oman. Their R.Mk 1 electronic intelligence counterparts flew from Akrotiri and other bases, gathering essential information on Iraqi emissions.

The maritime Nimrods worked closely with USS *Midway* and especially the Lynx HAS.Mk 3GM helicopters flown off several British ships in the region. The jets used their powerful Searchwater radar to gather data on shipping movements and this was used to great effect by the Lynx, which damaged at least 11 Iraqi vessels.

Rotary assets

A large helicopter force was formed at sea and at Al Jubail and Riyadh. As well as the Lynx, the Fleet Air Arm flew Sea King HC.Mk 4 assault helicopters and HAS.Mk 5 anti-submarine helicopters from Al Jubail and Royal Navy ships.

Three Army Air Corps squadrons brought their combination of Gazelle AH.Mk 1 scout helicopters and Lynx AH.Mk 7 anti-armour aircraft to Al Jubail. They subsequently 'disappeared' into the desert for the ground war, operating from forward locations in support of 1st (British) Armoured Division.

Finally, in its traditional role, the RAF provided UK forces with their support helicopter capability. It stationed Chinook HC.Mk 1 aircraft at Al Jubail and Riyadh, and Puma HC.Mk 1s only at the latter. The RAF lost six Tornado bombers in combat, plus two more and a Jaguar pre-war. ❖

With designation from the vintage Buccaneer, first the Muharraq and then the Dhahran Tornados began dropping CPU-123/B LGBs.

RAF (AHB)/© UK MoD Crown Copyright 2016



▲ Buccaneer XX885/L was named after the Famous Grouse whiskey brand. Its LGB mission marks included one for an An-12 transport destroyed on the ground.

Wikimedia Commons

◀ Neatly summarising Granby fast air in one image, this photograph shows a Tornado F3 leading a Buccaneer, Tornado GR1 and Jaguar. *Ian Black*

▼ The Jaguar fought a tough campaign, engaging battlefield targets and coastal installations from the first day of war. *Ian Black*



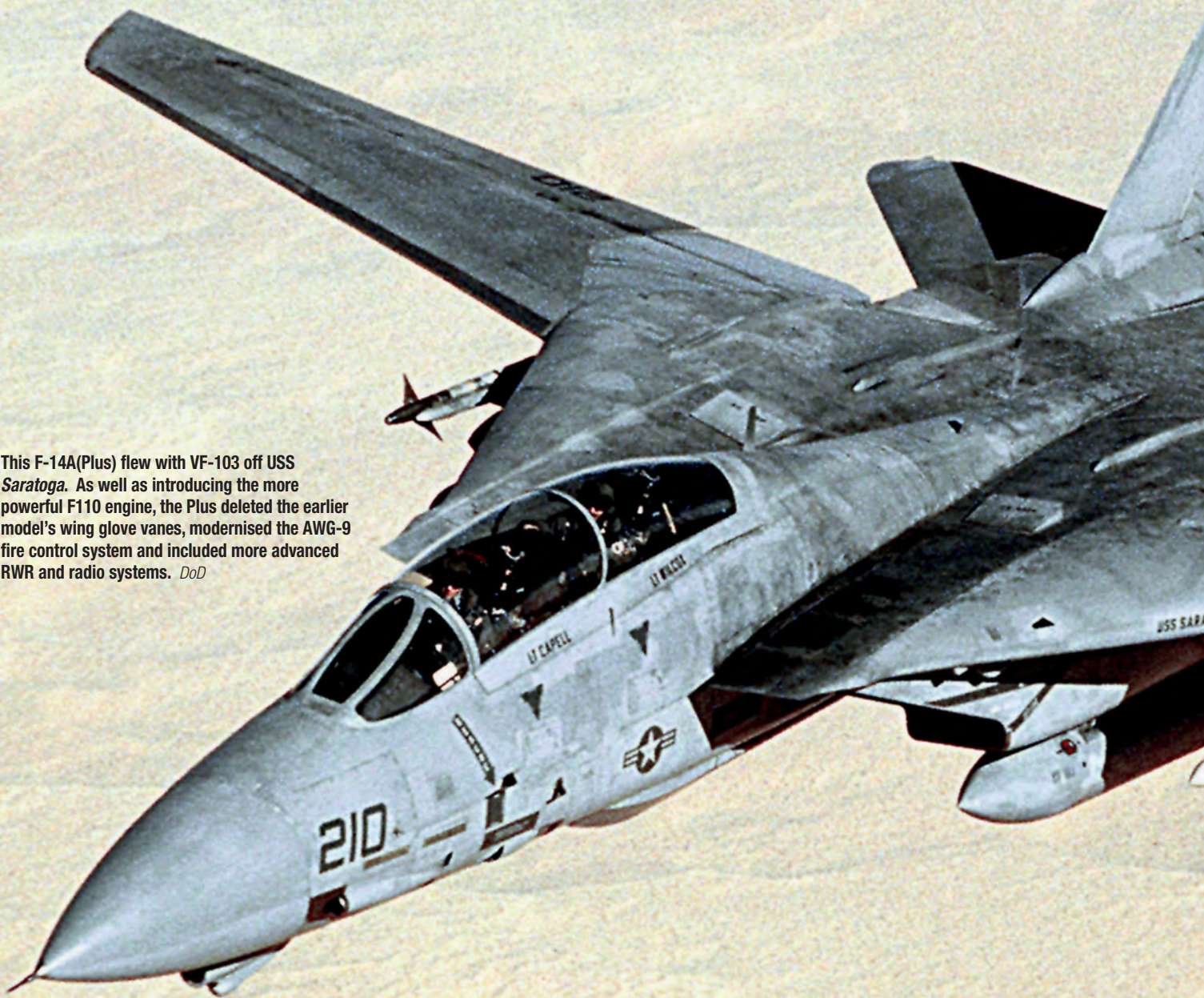
The first of the RAF's Pumas were deployed by USAF C-5 Galaxy and all gained desert pink paint. *Ian Black*



F-14 TOMCAT

A great deal was expected of the F-14 in aerial combat, but none of the limited opportunities to engage Iraqi warplanes fell to the US Navy's premier fighter. Instead it flew sterling escort and photo-reconnaissance work

This F-14A(Plus) flew with VF-103 off USS *Saratoga*. As well as introducing the more powerful F110 engine, the Plus deleted the earlier model's wing glove vanes, modernised the AWG-9 fire control system and included more advanced RWR and radio systems. DoD



After forcing actor Tom Cruise into second place in the 1986 movie 'Top Gun' and engaging Libyan fighters over the Gulf of Sidra in two less than straightforward clashes during the 1980s, the US Navy's Grumman F-14 Tomcat community was keen to show its mettle against Iraq. Twelve Tomcat squadrons were committed to the operation, flying off eight aircraft carriers.

The real 'Top Gun', the US Navy Fighter Weapons School had been formed after naval fighter pilots underperformed in early combats over Vietnam. The movie had brought Top Gun to the world's attention and perhaps

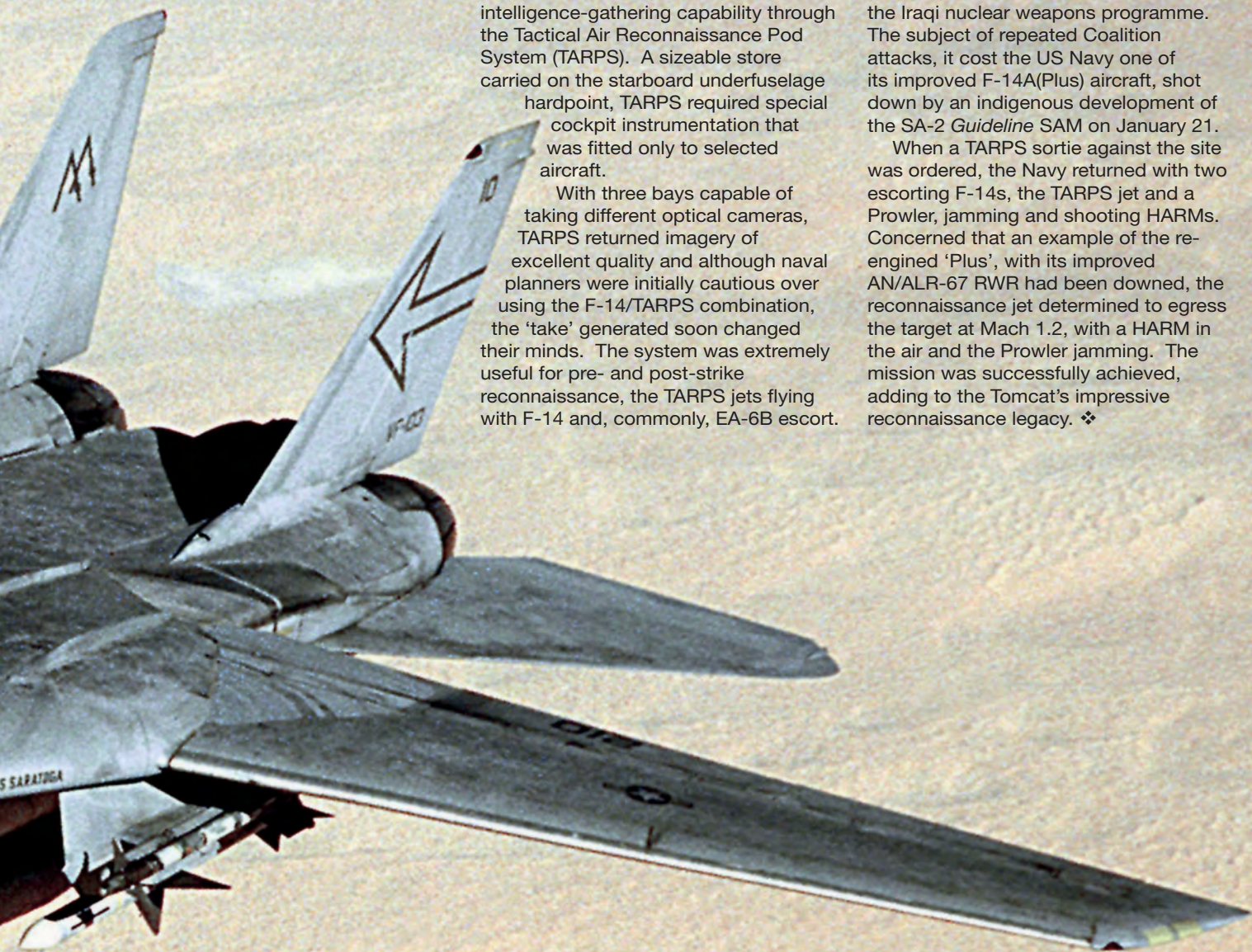
disguised the fact that the school really did turn out exceptional fighter crews; now those crews saw their opportunity to prove it.

Following established naval doctrine, the Tomcats flew vital fleet defence, air superiority and escort missions. The latter saw F-14s accompanying Corsairs, Hornets and Intruders as they went 'feet dry' over Kuwait and Iraq, often penetrating deep into enemy territory to hit key targets. Tomcat pilots claimed that though vital, these missions denied them the opportunity to engage the few Iraqi fighters in the air. The USAF's F-15 CAPs were in place to engage such

targets as they appeared, while the F-14s rightly stayed with their attack charges.

Tomcat Claws

There was no opportunity to demonstrate the long-range killing capability of the Tomcat's unique AGM-54C Phoenix missile, although crews reported that the emissions from the jet's AWG-9 weapons system, designed around the Phoenix, were sufficient to send the MiGs running. On February 6, however, a Mi-8 *Hip* helicopter fell to a VF-1 F-14A crewed by LT Stuart 'Meat' Broce and CMDR Ron 'Bongo' McElrath.



Tomcat Pictures

Less well known than its air-to-air prowess, the F-14 also had a powerful intelligence-gathering capability through the Tactical Air Reconnaissance Pod System (TARPS). A sizeable store carried on the starboard underfuselage hardpoint, TARPS required special cockpit instrumentation that was fitted only to selected aircraft.

With three bays capable of taking different optical cameras, TARPS returned imagery of excellent quality and although naval planners were initially cautious over using the F-14/TARPS combination, the 'take' generated soon changed their minds. The system was extremely useful for pre- and post-strike reconnaissance, the TARPS jets flying with F-14 and, commonly, EA-6B escort.

A particularly heavily defended target, the Al Qaim superphosphate fertiliser factory also generated products vital to the Iraqi nuclear weapons programme. The subject of repeated Coalition attacks, it cost the US Navy one of its improved F-14A(Plus) aircraft, shot down by an indigenous development of the SA-2 *Guideline* SAM on January 21.

When a TARPS sortie against the site was ordered, the Navy returned with two escorting F-14s, the TARPS jet and a Prowler, jamming and shooting HARMs. Concerned that an example of the re-engined 'Plus', with its improved AN/ALR-67 RWR had been downed, the reconnaissance jet determined to egress the target at Mach 1.2, with a HARM in the air and the Prowler jamming. The mission was successfully achieved, adding to the Tomcat's impressive reconnaissance legacy. ❖



This VF-32 formation, led by the full-colour jet of the squadron commander, was up during Desert Shield. The unit embarked in *Kennedy*, sailing in the Red Sea. LCDR Parsons/US Navy

GRUMMAN F-14A TOMCAT

- **Powerplant:** two Pratt & Whitney TF30-P-414A turbofans each rated at 20,900lb (92.97kN) thrust with afterburning
- **Performance:** maximum level speed at high altitude 1,342kt (2,485km/h), service ceiling more than 50,000ft (15,240m), CAP radius with six AIM-7 and four AIM-9 665nm (1,233km)
- **Dimensions:** wing span 64ft 1½in (19.54m) spread, 38ft 2½in (11.65m) swept; length 62ft 8in (19.10m), height 16ft (4.88m), gross wing area 565sqft (52.49m²)
- **Weights:** empty 40,104lb (18,191kg), maximum take-off 74,349lb (33,724kg), maximum stores load 14,500lb (6,577kg)



Retreating Iraqi forces set fire to oil wells across Kuwait. This is a VF-211 Tomcat, the unit deploying to the Gulf soon after the ceasefire. *DoD*



Awaiting a Desert Storm mission, this Tomcat demonstrates AIM-54 (under the fuselage), AIM-7 (on the main wing pylon) and AIM-9 missile installations. *PH3 Terry Simmons/US Navy*

F-14 TOMCAT DEPLOYMENT

UNIT	MODEL	BASE
VF-1	F-14A	USS <i>Ranger</i>
VF-2	F-14A	USS <i>Ranger</i>
VF-14	F-14A	USS <i>John F. Kennedy</i>
VF-32	F-14A	USS <i>John F. Kennedy</i>
VF-21	F-14A	USS <i>Independence</i>
VF-154	F-14A	USS <i>Independence</i>
VF-33	F-14A	USS <i>America</i>
VF-102	F-14A	USS <i>America</i>
VF-41	F-14A	USS <i>Theodore Roosevelt</i>
VF-84	F-14A	USS <i>Theodore Roosevelt</i>
VF-74	F-14A(Plus)	USS <i>Saratoga</i>
VF-103	F-14A(Plus)	USS <i>Saratoga</i>
VF-142	F-14A(Plus)	USS <i>Eisenhower</i>
VF-143	F-14A(Plus)	USS <i>Eisenhower</i>



The hose and drogue fitted to the KC-135's boom was a less than ideal solution to refuelling probed receivers. Naval aviators were nevertheless grateful to the USAF tanker crews, especially for their willingness to fly into Iraqi airspace. This VF-41 F-14A was tanking off an Illinois ANG KC-135E. *DoD*



Engaged on a Desert Storm sortie, this VF-32 F-14A shows the prominent undernose fairing associated with the type's AAX-1 Television Camera Set, which gave a useful optical target identification capability. *LCDR Parsons/US Navy*



This TARPS image shows the exceptional quality of the pod's 'take'. The reinforced concrete shelters, which have both been hit by LGBs, were photographed at Ahmed Al Jaber by a VF-84 Tomcat. *DoD*

TRISTAR, VC10 AND VICTOR



From late January, the Buccaneers joined the Tornado force to provide laser designation. Here the Tornado totes a pair of LGBs, while both aircraft wait to take fuel from a Victor. RAF (AHB)/© UK MoD Crown Copyright 2016

British air-to-air refuelling capability relied on converted airliners and a modified nuclear bomber. The TriStar, VC10 and Victor flew intensively, returning an impressive performance

While the fast jet deployments inevitably grabbed headlines from August 1990, for every squadron that moved to the Gulf, tanker support was the key enabler. The RAF tanker fleet comprised ex-British Airways Lockheed TriStars, three modified as K.Mk 1 tankers and three as KC.Mk 1 tanker/transport; former Gulf Air, East African Airways and British Airways Vickers VC10 and Super VC10 aircraft modified to K.Mk 2 and K.Mk 3 tanker standard; and the survivors of 24 Handley Page Victor K.Mk 2 tankers, produced by converting B.Mk 2 and SR.Mk 2 airframes during the 1970s.

The TriStars and VC10s were involved in moving the Tornado F3 and subsequent Jaguar and Tornado GR1 aircraft directly into theatre. Although the TriStars primarily moved between RAF Brize Norton, Oxfordshire and the Gulf, two of the K.Mk 1s occasionally flew combat sorties out of Muharraq, Bahrain.

On August 11, 1990 a pair of VC10s deployed to Seeb, Oman in support of the RAF Jaguar and Nimrod detachments, followed by other aircraft that flew from Muharraq and Riyadh. All nine of the



All of the Victors were on strength with the RAF's final operator of the type, No. 55 Sqn, based at Marham, Norfolk. XH671 was launching from its temporary home at Muharraq. RAF (AHB)/© UK MoD Crown Copyright 2016

available VC10 K.Mk 2 and K.Mk 3 aircraft moved into theatre once Desert Storm was under way.

With a large fleet of RAF fast jets deployed, even more tanker support was required, however, and four Victors flew to Muharraq on December 15, 1990. Two more arrived on January 16 and another pair three days later.

The Victor's war was similar to that of the VC10, refuelling British and US Navy jets from the first few hours of combat. The demand for fuel was huge – flying with heavy combat loads, the Tornado

bombers typically required two visits to the tanker on the way to their targets and another on the egress. The tankers awaited their charges close to and sometimes inside the border with Iraq.

Painted desert pink on January 18 and 23, the two K.Mk 1s involved in war missions were not permanently deployed and regularly returned to Brize. Nevertheless, their huge fuel offload capability enabled them to supply 1,000 tonnes of fuel, while the VC10 fleet delivered 6,800 tonnes in many more sorties. ❖



The TriStar K1 aircraft were restricted to single-point refuelling, since they lacked the wing hose drum units of the VC10 and Victor. *RAF (AHB)/© UK MoD Crown Copyright 2016*



An aircraft from a different age compared to the majority of Desert Storm participants, the Victor offloaded fuel via pods under its outer wings. *RAF (AHB)/© UK MoD Crown Copyright 2016*



With wing hoses trailing, VC10 K2 ZA144/E awaits its receivers. *Ian Black*



This Victor was at Jubail Airport, Saudi Arabia just after the war. *Lt Col Paul Backs/DoD*



LOCKHEED TRISTAR K.MK 1

- **Powerplant:** three Rolls-Royce RB211-524B turbofans each rated at 50,000lb (222.41kN) thrust
- **Performance:** maximum cruising speed at 35,000ft (10,670m) 520kt (964km/h), service ceiling 43,000ft (13,105m), range with maximum payload 4,200nm (7,783km)
- **Dimensions:** wing span 164ft 4in (50.09m), length 164ft 2½in (50.05m), height 55ft 4in (16.87m), wing area 3,541sqft (328.96m²)
- **Weights:** basic empty 242,684lb (110,163kg), maximum take-off 540,000lb (244,944kg)

VICKERS VC10 C.MK 1

- **Powerplant:** four Rolls-Royce RCo.43 Mk 301 turbofans each rated at 21,800lb (96.97kN) thrust
- **Performance:** maximum cruising speed at 31,000ft (9,450m) 505kt (935km/h), service ceiling 42,000ft (12,800m), range with maximum payload 3,385nm (6,273km)
- **Dimensions:** wing span 146ft 2in (44.55m), length 158ft 8in (48.38m), height 39ft 6in (12.04m), wing area 2,932sqft (272.38m²)
- **Weights:** empty 146,000lb (66,224kg), maximum take-off 323,000lb (146,510kg)

TRANSPORT TOO

The TriStar KC1's combined transport and tanker capability made it particularly useful on fast jet deployments, with heavy support equipment carried in the aircraft's cabin even as it refuelled the formation. However, the RAF also possessed two TriStar C.Mk 2 and one C.Mk 2A passenger transports and these were used intensively on the airbridge between the UK and the Gulf.

While the VC10 'Ks' were dedicated tankers, the RAF had for many years been operating the VC10 C.Mk 1. The type had quietly maintained a busy and essential link between the UK and Ascension Island during the 1982 Falklands War and performed the same feat between Brize and the Gulf during Desert Shield and Storm.

◀ Soon after their desert pink had been applied, TriStars ZD949 and ZD951 were christened 'Pinky' and 'Perky'. This is Perky. *Wikimedia Commons*



CONTINUED INVOLVEMENT

Under Operation Warden, the UK contributed to Provide Comfort and Northern Watch. In 1993 the Warden commitment passed from the Jaguar to the Harrier GR.Mk 7, including this aircraft. © UK MoD Crown Copyright 2016

Desert Storm was far from the end of Coalition involvement in Iraq. The original Coalition broke up, then elements reformed as forces primarily led by the US and UK fought a long series of minor actions that culminated in Operation Iraqi Freedom

Desert Storm had been a decisive victory, but the Coalition had followed UN instructions and stopped short of removing Saddam Hussein from power. With the leader weakened, ethnic Kurds in northern Iraq saw the opportunity for revolt, but Iraq's military machine was sufficiently intact to put down the rebels. The fighting created in excess of one million refugees, many of whom made their way into Iran and Turkey, while others clustered along the Turkish border.

The situation was desperate and the UN Security Council authorised relief efforts on April 3, 1991. Under Operation Provide Comfort, the USAF immediately began using assets recently employed against Iraq to bring relief to the Kurdish refugees. A NATO Combined Task Force (CTF) HQ, incorporating the USAF 7440th Composite Wing, already in place from Desert Storm, was established at Incirlik AB, Turkey to secure the airspace over Iraq north of the 36th parallel.

Using Incirlik as their main operating base, C-130s dropped the first aid on April 7, the airdrops continuing as C-5s

and C-141s flew freight into Turkey. On April 17, US troops took up ground positions, protecting the Kurds and building camps for their temporary shelter. A no-fly zone (NFZ) was established to deter Iraqi aggression in the region so that the refugees might return home safely.

The ground forces withdrew during the summer, leaving air power to police the region. A long-running game of cat and mouse ensued, and as retired ex-32nd FW F-15C pilot Colonel Doug 'Disco' Dildy recalls, after President George HW Bush lost his bid for re-election in November 1992, Saddam Hussein ordered his SAMs and interceptors – reduced to a handful of Mirage F1EQs and MiG-23/29s – to step up operations.

"The 32nd FS 'Wolfhounds', from Soesterberg AB, Netherlands, was sent to 'the Lik' to enforce the northern NFZ. Loaded with 'wall to wall missiles' and 'two bags of gas', on the drizzly, misty morning of December 3, 1992, we blasted off in full reheat with eight F-15 Eagles at 20-second spacing, disappearing 'into the goo' in a long radar trail formation that snaked across Belgium as we climbed southwards

through layer after layer of cloud. We rejoined on top, into two four-ships, somewhere over France.

"After rendezvousing with our RAF Mildenhall tankers over Sicily, 4.5 hours later we landed at Incirlik. For 159 days we operated alongside RAF Jaguars and RAF Upper Heyford F-111Es, and Armée de l'Air Mirage F1CR reconnaissance jets.

"Several Iraqi SAM sites were still active in the AOR [area of responsibility], so the CTF's two pairs of Wild Weasel F-4G/ F-16C hunter-killers frequently lobbed AGM-88s at those sites impudent enough to 'light up' a CTF jet with a tracking radar. On rarer occasions an Iraf interceptor would launch from Qayyarah West airfield and attempt entry into the NFZ.

We played a game of 'radar tag' with these challengers, but their practiced GCI controllers kept them just outside AMRAAM range. On 17 January, my wingman and I had just departed the AOR, and our replacements were 'topping up' from the tanker, when Iraqi GCI tried to take advantage of our absence and launched a MiG-23ML into the NFZ, attempting to attack an F-4G. Its F-16C



The 32nd FS flagship, MSIP F-15A 77-0100 *Queen of the Silver Dollar*, closes on the tanker high over the mountains of southern Turkey in January 1993. The Eagles typically carried four AIM-120s, two AIM-7Ms, a pair of AIM-9Ms and 'two bags of gas' on their NFZ missions. Doug Dildy Collection

wingman descended and Iraqi GCI lost track of it in the ground clutter, the *Flogger* being destroyed in the ensuing AMRAAM-initiated fireball.

"On Bill Clinton's inauguration day (January 20, 1993), Saddam ceased his war-like actions and, from that point on, our time at the Lik closely resembled Bill Murray's movie 'Ground Hog Day' – flying day after day, over the same terrain, and seeing nothing new... ever. On May 11, 1993 we were finally allowed to return to Soesterberg, having flown 763 sorties in our almost six month deployment."

The effort to protect the Kurds subsequently turned sour on April 14, 1994, when two F-15Cs accidentally shot down a pair of US Army Black Hawks in a botched engagement. Then, in 1996 the NFZ was expanded and the USAF carried out Operation Pacific Haven, airlifting almost 7,000 Kurds to Andersen AFB, Guam, as a transit stop on their way to new lives in the US.

Operation Provide Comfort became Operation Northern Watch on January 1, 1997, reflecting its change of focus from relief to no-fly zone. It continued until May 1, 2003.

Southern Watch

In April 1991 a Southern NFZ was established to enforce UN Security Council Resolution 688, for the protection of Shiite Muslims falling under attack by the Iraqi military. It encompassed southern Iraq from the 32nd parallel down to the country's borders with Kuwait and Saudi



A USMC CH-53E Super Stallion offloads supplies during Provide Comfort. JOC Marjie Shaw/DoD

Arabia. In October 1991 it was extended to include vehicle movements, and Joint Task Force-Southwest Asia (JTF-SWA) was tasked with its enforcement, operating aircraft alongside the British and French.

Hussein first challenged the NFZ on December 27, 1992. Two MiG-25s entered the area and USAF F-16s shot one down. In January 1993, USAF jets attacked missile sites in the NFZ and strikes continued in April, June and July of that year.

In October 1994, Operation Vigilant Warrior saw 25,000 US troops move into the region as Iraqi forces gathered on the Kuwaiti border. The moment passed, but some troops remained under Operation Vigilant Sentinel.

On June 25, 1996, terrorists bombed the Khobar Towers barracks on Dhahran AB. The USAF lost 19 personnel in the attack, with 547 injured, but Southern Watch continued until Operation Iraqi Freedom began in 2003.



In a scene that could easily have been from Desert Storm half a decade earlier, a KC-135R refuels a VFA-131 F/A-18C during a Southern Watch sortie. *US Navy*

Desert Strike

On August 31, 1996, Hussein's forces invaded Erbil in northern Iraq during the Kurdish civil war. The action violated UN resolutions and the US responded with cruise missiles fired from ships and B-52s flying from Andersen. The Southern NFZ was also further north.

Desert Fox

In the most extensive action against Iraq since Desert Storm, Operation Desert Fox came as Hussein continued to deny access to UN weapons inspectors. Launched in autumn 1998, Desert Fox aimed to degrade Iraq's ability to create, store and employ weapons of mass destruction (WMD).

On December 16, British and US aircraft began a series of attacks in the wake of a massive Tomahawk cruise missile barrage. On the 17th, B-52s flying out of Diego Garcia launched cruise missiles and the Rockwell B-1B Lancer entered combat for the first time, hitting Republican Guard targets. The operation was declared a success and concluded on December 19.

Iraqi Freedom

After al-Qaeda attacked New York and Washington on September 11, 2001, the US launched Operation Enduring Freedom against the Taliban and al-Qaeda in Afghanistan. Under this so-called War on Terror and claiming that Iraq had continued with its WMD programme and was sheltering al-Qaeda terrorists, the US and UK formed a Coalition to finally remove Hussein from power.

Operation Iraqi Freedom began on March 9, 2003 when leaflets were dropped, ensuring the Iraqi people that the Coalition



Doug Dildy ready for a mission from Incirlik. The Turks did not allow CTF take-offs until sunrise – the imminent glow of which is curving across the Eagle's canopy. The en route time to the AOR was one hour, so the jets would launch, sweep the area and then 'hit the tanker' to top up for a two-hour patrol. *Doug Dildy Collection*

offered them support. On March 19, F-117s hit the Dora Farms complex near Baghdad, where Hussein was reported to be, but he was not eliminated. On the following day, in excess of 1,700 sorties and missile attacks were launched.

Turkish bases were not made available and instead the Coalition sought to establish an air base in Iraq. On March 26, therefore, C-130 and C-17 Globemaster III transports dropped paratroopers and personnel from the USAF's 86th Contingency Response Group to secure Bashur airfield near Erbil, northern Iraq.

By April 30, 2003, the Coalition had 1,801 aircraft in theatre, while the CRAF had moved almost 100,000 troops to the

AOR. The major element of fighting had ended by May 1, 2003, but with the fall of the Iraqi government the country quickly became unstable. A long and bloody insurgency followed, continuing even after Hussein's execution in 2006.

In September 2010 Iraqi Freedom gave way to Operation New Dawn, as British and US involvement in Iraq drew down. On May 22, 2011 the last British personnel left the country and on December 15 the final US troops followed. They left behind them a barely stable nation that inevitably descended into civil war, once again drawing in Coalition air power but this time to fight a sinister new threat – IS. ❖

The UK called its contribution to Iraqi Freedom Operation Telic. It involved all three services, their co-operation exemplified here as an Army Air Corps Lynx AH.Mk 7 works with an RAF Regiment Land Rover near Basra. Harland Quarrington/© UK MoD Crown Copyright 2016



Desert Fox saw the combat debut of the USAF's B-1B and of female US Navy fighter pilots. Relating details of her first mission, LT Carol Watts flew an F/A-18C off USS *Enterprise*. DoD

C-130 HERCULES

A workhorse of almost every conflict involving US or UK forces since the 1960s, the C-130 Hercules served in roles ranging from tactical transport to minefield clearance



Operations to and from rough airstrips were expected to gain increasing importance during the ground war. Casualty evacuation from desert runways might have been a key C-130 mission had the conflict developed as expected. This C-130E was flown by the 314th Tactical Airlift Wing (TAW), based at Little Rock, Arkansas. *TSgt Hans Deffner/USAF*

Ubiquitous in the world's air forces as a transport, the Lockheed C-130 Hercules was indeed a stalwart of intra-theatre tactical airlift throughout Desert Shield and Storm. But it also flew long-range strategic missions in support of the massive movement of materiel and personnel into the region and other less obvious roles also came the 'Herc's' way. Specialised variants undertook roles as far ranging as tanking and psychological warfare.

Movers

Pure transport Hercules flew primarily with the USAF and RAF, but other nations, including Australia, New Zealand and the Republic of Korea added to the force. Many active duty, AFRes and ANG units contributed to the USAF C-130E and H fleet, which had completed 11,799 missions by the end of Desert Shield. Much of their work was mundane 'trash hauling', but the 'vanilla' Herc also found its way into several special operations.

It was Hercules that moved the 82nd Airborne Division into a FOL and helped position other troops ready for the Coalition flanking manoeuvre, and also the Hercules that set up in the desert,

ready to resupply and move equipment and troops from unprepared strips. After the ground war began, appalling weather soaked the desert, preventing much of the anticipated movement of supplies by truck, leaving the C-130 to airdrop vital materiel, including ammunition, direct to the frontline.

The RAF began establishing a Hercules detachment at Riyadh on November 1, 1990. By the middle of January 1991 it was up to nine aircraft, two of them supplied and crewed by the Royal New Zealand Air Force. Using Riyadh as their hub, they ranged far and wide, distributing freight brought in from the UK. Five more Hercs were based in the UAE for special forces support.

Broadcasters & Jammers

Two variations on the EC-130 electronic warfare Hercules, the EC-130E and EC-130H, provided exceptional Gulf War service. The regular EC-130E Airborne Battlefield Command and Control Center (ABCCC) version housed a modular control centre comprising conventional systems in its ABCCC II form and digital equipment in ABCCC III configuration.

The EC-130E Comfy Levi (CL) and Rivet Rider (RR) Volant Solo II aircraft were rather more specialised, however, flying psychological warfare operations with native Arabic speakers who broadcast across Iraqi radio and television frequencies.

LOCKHEED C-130H HERCULES

- **Powerplant:** four Allison T56-A-15 turboprops each rated at 4,508shp
- **Performance:** maximum cruising speed 325kt (602km/h), service ceiling 33,000ft (10,060m), range with maximum payload, 5% reserves and 30 minutes at sea level 2,046nm (3,791km)
- **Dimensions:** wing span 132ft 7in (40.41m), length 97ft 9in (29.79m), height 38ft 3in (11.66m), wing area 1,745sqft (162.12m²)
- **Weights:** operating empty 76,469lb (34,686kg), maximum overload take off 175,000lb (79,380kg), maximum payload 42,673lb (19,356kg)



▲ The majority of the RAF's Hercules assembled into the Air Transport Detachment at Riyadh, where two RNZAF aircraft joined them. All but two retained the tactical camouflage shown here, the exceptions receiving the familiar desert pink. RAF (AHB)/© UK MoD Crown Copyright 2016



Shortly after the last Iraqi troops had been forced out of Kuwait, these XVIII Corps, US Army soldiers were airlifted out to Fort Bragg, North Carolina. The Hercules in the foreground belonged to the Missouri ANG's 180th Tactical Airlift Squadron (TAS). TSgt Donald S McMichael/USAF

AIRCRAFT

The Hercules roamed far and wide during the build up to Desert Storm, through the war and in its aftermath. Among its vital contributions to Coalition victory was the movement of 101st Airborne Troops into the Iraqi desert – this aircraft was landing to deposit another load of the unit's personnel on an improvised road runway.

Maj Kuenning/DoD



A West Virginia ANG Hercules moves troops during a Desert Storm mission. *TSgt Hans Deffner/USAF*

A small number of EC-130H Compass Call aircraft jammed Iraq's communications and radar, severely degrading its military's ability to conduct co-ordinated operations. Contemporary reporting suggests that by January 23, Iraqi emission had been reduced by as much as 95%, thanks largely to the EC-130H. Some EC-130Hs flew out of Incirlik, but the primary EC-130 operating base was Riyadh.

Gunships and Tankers

Two squadrons deployed the devastating AC-130 Spectre gunship. The 16th Special Operations Squadron, 1st Special Operations Group flew its AC-130H aircraft in from Hulbert Field, Florida and the 711th SOS, 919th SOG, AFRes brought its AC-130A machines from Duke Field, Florida.

The older A-model featured a pair of 40mm cannon, two 20mm Vulcan rotary cannon and two 7.62mm Miniguns, while the 'H' substituted one of the 40mm weapons for a 105mm howitzer and dispensed with the Miniguns.

The Spectres specialised in delivering their withering firepower close to friendly troops and in one such instance on January 31, AC-130H call sign SPIRIT

03 was shot down while assisting US Marines. It crashed off the Kuwait coast with the loss of all 14 crew.

Five AFRes AC-130As served, including 55-0014, which joined its squadron mates in missions along the Kuwait/Iraq border, before joining the campaign against Iraqi forces retreating along the road between Kuwait City and Baghdad.

In a mission not atypical for this stage in the campaign, on the night of February 26/27, the aircraft's crew successfully decoyed a SAM using infrared flares, before joining combat over what later became known as the 'Highway of Death'. That night they destroyed in excess of 20 trucks and four armoured personnel carriers as their contribution to between 1,400 and 2,000 vehicles caught along the road.

The Hercules also took its turn supporting US Marines in the air, a composite USMC squadron using the KC-130F, R and T variants for air-to-air refuelling across the region, as well as supporting deploying aircraft. Once combat was joined, the KC-130s offered fuel to strike packages, their hose and drogue systems a useful supplement to those of the far more numerous jet-powered tankers.



Several Hercules acquired nose art, including this 435th TAW aircraft out of Rhein-Main, Germany. *MSgt Jose Lopez/USAF*

CSAR and Special Forces

Flown by the 9th SOS, 1st SOW from Eglin, Florida and the 67th SOS, 39th SOW from RAF Woodbridge, UK, the HC-130N and P were dedicated rescue platforms with an important combat search and rescue (CSAR) capability. Equipped with underwing air-to-air refuelling pods, the HC-130s accompanied USAF MH-53J and MH-60G CSAR helicopters on long-range missions, often employing tactics 'borrowed' from their MC-130E special forces colleagues.

A dedicated special forces support platform, the MC-130E Combat Talon I was optimised for the covert ingress and egress of personnel deep inside enemy territory. Such missions were important for inserting and supplying reconnaissance teams, and for targeting.

The MC-130E also took on the unusual role of minefield clearance, using the 15,000lb BLU-82 bomb. Developed for its ability to clear patches of Vietnamese forest and create 'instant' helicopter landing zones, the airburst BLU-82 was also an effective mine clearance device. Pallet mounted, the weapon was simply pushed from the aircraft's open rear ramp. ❖



During Desert Storm the F-15E was a relatively immature platform. Today it is among the world's most capable precision strike platforms and firmly committed to the war against IS. *Senior Airman Kate Thornton/USAF*

OPERATION INHERENT RESOLVE

A new Coalition is prosecuting the war against IS terrorism with a new generation of weaponry, as Thomas Newdick explains

Shortly after the US-led invasion of Iraq in March 2003, an insurgency began to target Coalition forces in the country. After the removal of Saddam Hussein, insurgents began to attack the newly installed Iraqi security forces, and by early 2006 the insurgency had become a full-blown sectarian civil war.

By summer 2013 a new force had begun to make serious gains in the country. Various known as the Islamic State of Iraq and the Levant (ISIL), the Islamic State of Iraq and Syria (ISIS), or simply Islamic State (IS), militants from this organisation had captured the cities of Mosul and Tikrit in June 2014. By the end of the month, and on the back of territorial gains made in both Iraq and Syria, IS had declared a caliphate.

Air Strikes

Initial allied air operations to counter the IS offensive involved airdropping supplies to the Yazidi community, trapped on Mount Sinjar, in early August 2014. On August 7, President Obama announced that air strikes would begin, with the initial aim of protecting US diplomats in Iraq, and supporting Iraqi government forces. By the end of the month, the strategically important Mosul Dam had been retaken from IS forces. An anti-IS coalition was formally established during a NATO Summit on September 5, and within a week ten Arab nations had committed to the effort.

In mid-September 2014, IS launched a major offensive against the town of Kobane, in Syria, and on September 23,

concerted air strikes targeted IS positions in that country, with aircraft from the US, Bahrain, Jordan, Qatar, Saudi Arabia and the United Arab Emirates all involved. On September 26 the British government approved air strikes by the Royal Air Force in Iraq, and Tornados began armed reconnaissance missions over the country the next day.

Operation Inherent Resolve

Almost ten weeks after the US began anti-IS air strikes in Iraq, the Joint Staff announced that the campaign was now named Operation Inherent Resolve.

The US Navy's carrier battle groups have been at the centre of anti-IS operations. When the first air strikes were flown, USS *George HW Bush* was



The US Navy makes extensive use of the latest, two-seat F/A-18F Super Hornet, a massive evolution from the Hornet used widely in 1991. US Navy

on station in the Persian Gulf. In August 2014 it was replaced by USS *Carl Vinson*, which remained until August 2015, alongside USS *Theodore Roosevelt* (April to October 2015). USS *Harry S Truman* arrived in the Gulf in December 2015.

US Air Force assets are operating from Muwaffaq Salti Air Base in Jordan (F-16Cs), Ahmed Al Jaber AB in Kuwait (A-10Cs), Al Udeid AB in Qatar (F-15Es, B-1Bs), Al Dhafra AB in the UAE (F-22As and F-15Es), and from Incirlik in Turkey (A-10Cs, F-16Cs, F-15Cs and F-15Es).

Long-range missions by USAF B-1B Lancer bombers have also been flown direct from Ellsworth Air Force Base, South Dakota and Dyess AFB, Texas. US Marine Corps combat assets have been located at Isa AB, Bahrain, and include AV-8Bs and F/A-18Cs.

Coalition Effort

The British anti-IS effort, Operation Shader was initially spearheaded by Tornado GR4s based at RAF Akrotiri in Cyprus and MQ-9 Reapers at Ali Al Salem AB, Kuwait. Typhoon FGR4s joined them in December 2015 as air strikes were expanded from Iraq to Syria.

Australia's Operation Okra has seen the involvement of both F/A-18A and F/A-18F aircraft, supported by KC-30A tankers and E-7A airborne early warning and control (AEW&C) assets, all of which operate from Al Minhad AB.

Operation Impact is the codename for Canada's contribution, which is headed by CF-188s based at Ahmed Al Jaber AB.

French operations against IS are being conducted under *Opération Chammal* and have involved the carrier *Charles*



Tornado has also evolved. The RAF's Tornado GR4 offers the Coalition unique precision capabilities combined with minimal collateral damage. Tornados and Typhoons operate out of RAF Akrotiri. Cpl Neil Bryden/© UK MoD Crown Copyright 2016

de Gaulle, with embarked Rafale M and Super Etendard jets, and Rafale B/C and Mirage 2000D/N aircraft based at King Abdullah II AB in Jordan and Al Minhad AB in the UAE.

Other European air arms that have seen involvement in air operations over Iraq and Syria comprise Belgium (F-16s at Muwaffaq Salti AB, until withdrawn in July 2015), Denmark (F-16s at Ahmed Al Jaber AB until August 2015), Italy (Tornado IDS at Ahmed Al Jaber), the Netherlands (F-16s at Muwaffaq Salti AB) and, most recently, Germany (Tornado ECR at

Incirlik, since December 2015, supported by an A310).

As of January 3, 2015, the Coalition had flown 9,379 strikes in Operation Inherent Resolve, of which 6,217 were over Iraq and 3,162 over Syria. Of the Iraq missions, US aircraft were responsible for 7,260. Australia, Belgium, Canada, Denmark, France, Jordan, the Netherlands and the UK had also flown sorties over Iraq. Meanwhile, Australia, Bahrain, Canada, France, Jordan, Saudi Arabia, Turkey, the UAE and the UK had conducted missions over Syria. ❖

Uninhabited air vehicles are a major feature of Inherent Resolve. This is a USAF General Atomics MQ-1 Predator.

Senior Airman Julianne Showalter/USAF



After the Paris attacks in November 2015, France is pursuing IS with a hardened resolve. Its effort includes the formidable Dassault Rafale. *US Navy*



The US Marine Corps continues to rely on the Harrier. The radar-equipped AV-8B Harrier II Plus is a post-Desert Storm innovation. *MCSA Ryre Arciaga/US Navy*



Electronic warfare has taken on a new relevance in the asymmetric war with IS. The EA-18G Growler has replaced the EA-6B in US Navy service. *US Navy*

F/A-18 HORNET



The Hornet served US Navy and Marine Corps fighter attack squadrons, as well as the Canadian Armed Forces. It proved more than capable in combat, testing the strike fighter concept against a pair of MiGs

When the US Navy began sailing for the Gulf in 1990, the McDonnell Douglas F/A-18 Hornet had all but replaced the A-7 on its carrier decks. The new jet was designed as a strike fighter, equally capable in air-to-air combat as it was air-to-ground, and with the possibility for flying equipped to take on both roles in a single mission. It was an as yet untried concept.

Given its relatively short range, the Hornet frequently flew with three drop tanks, a configuration that still left hardpoints for pairs of AIM-7 and AIM-9 AAMs, and as many as four 1,000lb Mk 83 bombs or two HARMs.

After the first intensive night of combat, the VFA-81 F/A-18C of Lieutenant Commander Michael 'Spike' Speicher was shot down by a SAM, focussing the minds of the Hornet pilots flying the first daylight strikes. Among them, LCDR Mark Fox and LT Nick Mongillo were part of a four-ship package taking eight 2,000lb Mk 84s each to H-3.

As they egressed the target area, an E-2 Hawkeye called MiGs running in towards them at 15 miles. Fox recalled: "The MiGs approached us, nose on, supersonic at Mach 1.2. Our relative rate of closure was more than 1,200kt."

He fired a Sidewinder at the leader, was unsure the missile had guided and sent an AIM-7 in its wake. "The first missile actually did the job and the Sparrow flew into the fireball." Mongillo took the second MiG-21 with a Sparrow, both Hornets retaining their 8,000lb bomb loads throughout. The strike fighter concept had been validated.

The Hornet also took on an important HARM-shooting role, as well as bombing with Mk 80-series weapons, cluster munitions and a range of guided ordnance. A VFA-87 F/A-18A shot down on February 5 was the final US Navy Hornet loss.

Marine Hornets

The Marine Corps flew its land-based Hornets in similar roles to the US Navy, albeit more closely tied to the needs of troops on the ground and primarily over Kuwait. The Corps also enjoyed the presence of Marine Attack Squadron (All Weather)-121, which brought the two-seat F/A-18D into theatre and flew in the fast-FAC role.

An F/A-18D crew was among the first to spot the Iraqi road columns moving out of Kuwait City, three of the jets directing strikers against the convoy and

orchestrating the carnage that ensued. Marine Corps Hornets took combat damage, but proved extremely resilient, at least one returning with a shattered port engine exhaust after taking a SAM hit. ❖

MCDONNELL DOUGLAS F/A-18C HORNET

■ **Powerplant:** two General Electric F404-GE-400 turbofans each rated at 16,000lb (71.17kN) thrust with afterburning

■ **Performance:** maximum level speed 'clean' at high altitude more than 1,033kt (1,915km/h), combat ceiling around 50,000ft (15,240m), combat radius more than 575nm (1,065km) on an attack mission

■ **Dimensions:** wing span 37ft 6in (11.43m), length 56ft (17.07m), height 15ft 3½in (4.66m), wing area 400sqft (37.16m²)

■ **Weights:** empty 23,050lb (10,455kg), normal take-off for an attack mission 51,900lb (23,541kg), maximum stores load 15,500lb (7,031kg)



▲ Marine Corps groundcrew daubed a message to the Iraqi leadership on this Mk 83. The 'Death Angels' were VMFA-235. *CWO4 JM Rodriguez/DoD*

◀ Each carrying a typical load of four bombs and a similar number of AAMs, these VFA-81 F/A-18Cs were refuelling from a KC-135E on their way to a target. By this time the unit had already lost one of its aircraft to a SAM. *TSgt Donald McMichael/USAF*

▼ Preparing for a Desert Shield mission, the VMFA-333 F/A-18A in the foreground has a Sparrow mounted on its outer underwing pylon. A bomb or HARM was a more likely fit in this position for the combat operations that followed. *MSgt Bill Thompson/DoD*





US F/A-18 HORNET DEPLOYMENT

UNIT	MODEL	SHIP/BASE
US Navy		
VFA-15	F/A-18A	USS <i>Theodore Roosevelt</i>
VFA-87	F/A-18A	USS <i>Theodore Roosevelt</i>
VFA-25	F/A-18C	USS <i>Independence</i>
VFA-113	F/A-18C	USS <i>Independence</i>
VFA-81	F/A-18C	USS <i>Saratoga</i>
VFA-83	F/A-18C	USS <i>Saratoga</i>
VFA-82	F/A-18C	USS <i>America</i>
VFA-86	F/A-18C	USS <i>America</i>
VFA-131	F/A-18C	USS <i>Eisenhower</i>
VFA-136	F/A-18C	USS <i>Eisenhower</i>
VFA-151	F/A-18A	USS <i>Midway</i>
VFA-192	F/A-18A	USS <i>Midway</i>
VFA-195	F/A-18A	USS <i>Midway</i>
US Marine Corps		Sheikh Isa AB, Bahrain
VMFA-212	F/A-18C	
VMFA-232	F/A-18C	
VMFA-235	F/A-18C	
VMFA-314	F/A-18A	
VMFA-333	F/A-18A	
VMFA-451	F/A-18A	
VMFA(AW)-212	F/A-18D	

▲ A centreline drop tank might suffice when range was less of a concern, leaving all four underwing pylons for ordnance. The nearer aircraft here totes Mk 7 dispensers, while the centre machine has a mixed load of bombs and HARMs. *Wikimedia Commons*



Shipborne bombs often feature a 'bumpy' ablative coating that prevents them burning should there be a fire onboard. This 500lb Mk 82 was on an F/A-18A. *Lt Parsons/US Navy*



Photographed during Saratoga's deployment through the Mediterranean to join the 6th Fleet in the Red Sea for Desert Storm, F/A-18C Hornet 163484/403 was the jet in which 'Spike' Speicher was killed on January 17. *Jean-Jacques Petit via Tom Cooper*



Launching for a Desert Storm mission, these VMFA-232 jets are part of a self-supporting strike package that was typical of USMC operations. The taxiing jet is configured for SEAD, while the Hornet on the runway carries bombs. *Wikimedia Commons*

CANADA'S CONTRIBUTION

The major part of Canada's contribution to the Coalition effort, 18 CF-188s departed the Canadian Armed Forces (CAF) base at Söllingen, Germany on October 6/7, 1990. Hailing from 409 Sqn, the aircraft set up camp at Doha, mounting CAPs to protect Coalition shipping from the threat of Mirage F1-launched Exocet missile attacks.

Later, personnel from 439 and 416 Sqns took over the detachment and on January 12, 1991 six more aircraft arrived, followed soon after by two more. With Desert Storm under way, the CF-188s were authorised to begin 'sweep and escort' sorties, flying their first on January 24. From February 25 they began CAS missions, completing 56, as well as 770 CAPs and 168 sweep and escort, during the campaign.



Led by a French Mirage F1, this international formation includes a Qatari F1 and Alpha Jet, USAF F-16 and Canadian CF-188. *SSgt Lee Corkran/USAF*

A-7 CORSAIR II

Snatched from the brink of retirement for one last combat cruise, the A-7 turned in a brilliant performance from the war's opening day to its conclusion

Vought's A-7E Corsair II really should not have made Desert Storm at all, since its four remaining frontline squadrons were in the process of disbandment or re-equipment as Desert Shield began. Both VA-46 and VA-72 were down to half complements of aircraft and personnel as they worked to transition onto the F/A-18, while VA-37 and VA-105 were well along in the process of decommissioning.

When *JFK* sailed for the Red Sea on August 15, 1990 it needed two light attack squadrons to complete its complement and VA-46 and 72 were quickly brought back up to strength and flown on, while VA-37 and 105 took over the conversion to Hornets. When combat commenced, the veteran Corsairs excelled.

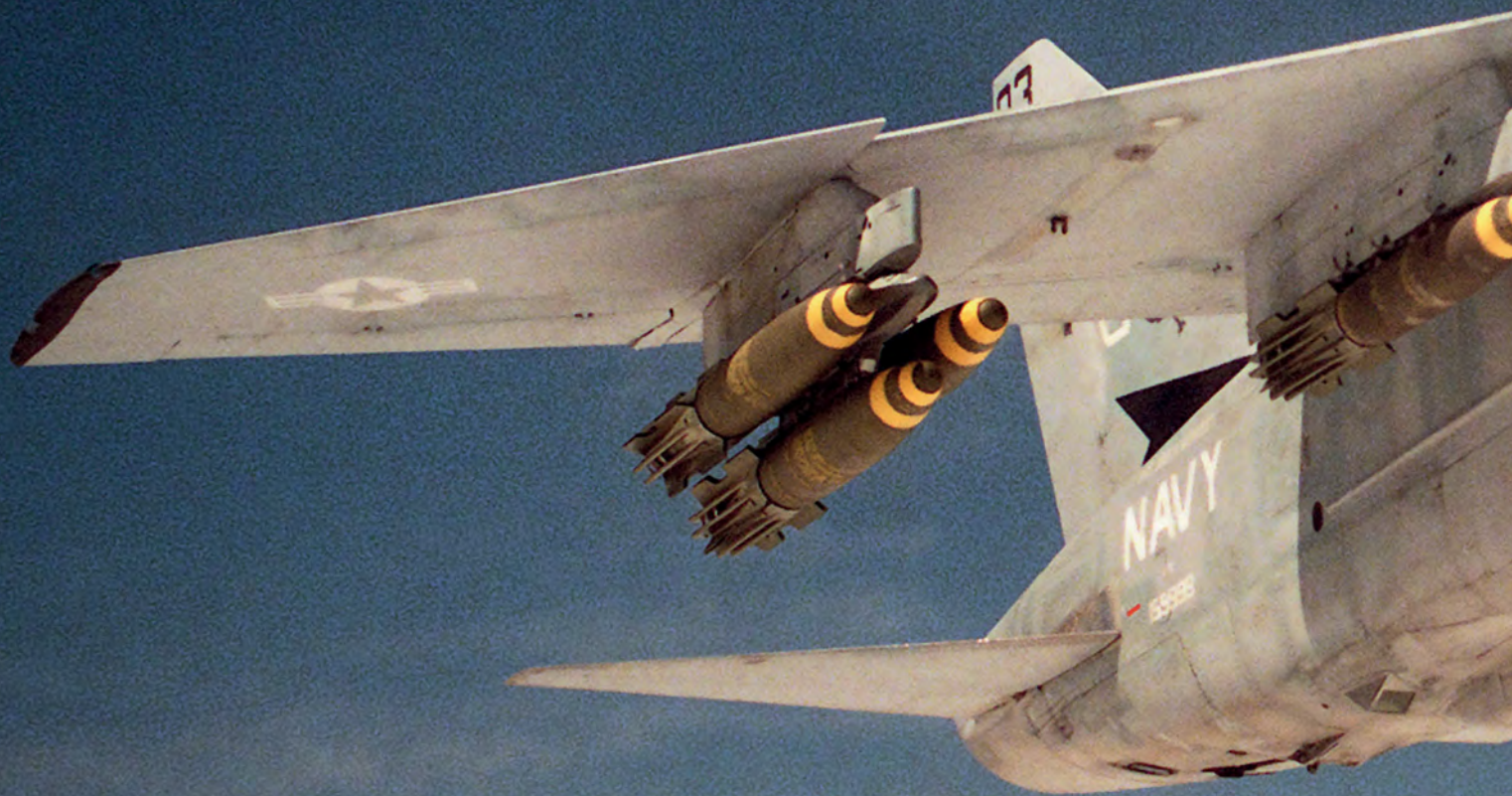
They launched for missions en masse, sometimes as two complete squadrons, demonstrating just how reliable the old workhorse had become and testament to the quality of their engineering support. The aircraft's unusual cheek pylons typically mounted AIM-9s, while its wing hardpoints hauled the regular selection of drop tanks, iron bombs and dispensers. However, the Corsair also demonstrated a perhaps unexpected talent for SEAD and precision engagement.

Flying SEAD escort for their squadron mates and other strikers, the A-7s made extensive use of HARMs, but also engaged targets with the electro-optically guided AGM-62 Walleye glide bomb. And when the Navy's A-6Es fired the still-in-development AGM-64E

SLAM in combat, guidance was via the Walleye's AWW-9 data link pod, carried by the A-7E.

Thus an aircraft on the brink of retirement took a leading role in the carrier war and became involved in the delivery of ordnance so new that it had not been issued to the fleet. No A-7s were lost in combat, but one VA-72 aircraft suffered a technical failure and took the barrier on landing. It was badly damaged and with the type due for imminent retirement, the airframe was stripped of useable parts and then pushed over the side.

The squadrons made a triumphant return to their Cecil Field, Florida home base and disbanded on May 23, 1991. They had flown 731 Desert Storm sorties for more than 3,100 flying hours. ❖



Eight 500lb bombs make their way to the target thanks to a VA-72 A-7E. The weapons have FMU-113 radar proximity fuses and Snakeye tailfins, which popped out on release to slow their fall. The aircraft also has Sidewinders on the unusual cheek pylons that were a feature of the A-7. *CMDR Leenhouts/US Navy*



VOUGHT A-7 CORSAIR II

- **Powerplant:** one Allison TF41-A-2 turbofan rated at 15,000lb (66.60kN) thrust
- **Performance:** maximum level speed 'clean' at sea level 606kt (1,123km/h), service ceiling 42,000ft (12,800m), combat radius 621nm (1,151km) on a hi-lo-hi mission
- **Dimensions:** wing span 38ft 9in (11.81m), length 46ft 1½in (14.06m), height 16ft (4.88m), wing area 375sqft (34.83m²)
- **Weights:** empty equipped 19,915lb (8,988kg), maximum take-off 42,000lb (19,050kg), maximum stores load 20,000lb (9,072kg)

A-7 CORSAIR II



Carrying only a pair of drop tanks, this VA-72 Corsair was low over Saudi Arabia during Desert Shield. *Wikimedia Commons*



Aircraft 159999/403 was the hapless machine that suffered nose undercarriage failure on approach to land. Note that it brought back live ordnance. *PH3 Fillion/US Navy*

Outbound for a mission, this formation demonstrates the A-7's considerable flexibility. Most of the Corsairs are hauling four Mk 83s, but the aircraft off the KC-135E's right wing has two HARMs to starboard and most likely two more opposite. The A-6E on the tanker's boom is itself configured for tanking, with four 'bags of gas' and a buddy refuelling pod on its centreline.

Wikimedia Commons



Camel mission marks record this VA-72 Corsair's impressive accumulation of sorties. PH3 Paul A Hawthorne/US Navy



▲ The A-7E was the primary Walleye user, delivering the majority of the 131 weapons expended during Desert Storm. Most were to the AGM-62 Extended Range/Data Link (ER/DL) Walleye II standard seen on this VA-72 jet.

PH2 William A Lipski/
US Navy

◀ Kennedy's CAG bird received unique desert camouflage. PH3 Paul A Hawthorne/US Navy

After carrying a MIF boarding party to inspect the vessel on the horizon, this Greek Agusta-Bell AB212ASW was returning to its parent ship, HS *Limnos*. PH2 Milton R Savage/US Navy



OTHER COALITION PLAYERS

Outside the core Coalition members, several countries made combat or transport contributions to the primary war effort, while others played less well recognised supporting roles

Of the smaller contributions to the Coalition, those of Canada and Italy were the only detachments including warplanes that took part in Desert Storm. Under Operation Friction, Canada's CF-188s arrived at Doha from October 1990 and were permitted only to undertake air-to-air missions until the ground war began, after which they completed a number of CAS sorties. The CC-137 tanker and various Hercules provided support to Canadian Armed Forces operations.

Flying under Operation Locusta, Italy's Tornado contingent had a difficult war out of Al Dhafra. It lost a jet on its first wartime mission, while the other aircraft despatched failed to bomb. Subsequently keeping tanking and attack efforts 'in house', the Italians succeeded in flying a number of sorties with unguided weapons.

Other nations provided transports that regularly moved in and out of theatre, including Australia and the Republic of Korea (both using C-130s) and Argentina, which employed a Fokker F28 Fellowship.

Aircraft from the US Civil Reserve Air Fleet (CRAF), comprising machines from contracted airlines, delivered huge numbers

of personnel and large quantities of freight into the area, as did chartered aircraft working for other nations; even giant Soviet Antonov An-124 airlifters were involved.

Supporting Roles

Following US Security Council Resolution 661, a multi-national Maritime Interdiction Force (some sources quote Maritime Interception Force, MIF) was established to intercept shipping heading for Kuwait or Iraq during Operation Desert Shield. Vessels and helicopters were involved in the effort, including contributions from Argentina and Greece.

In December 1990, the Turkish government requested additional protection against possible Iraqi aggression and in a move that almost certainly helped ensure the 7440th CW's access to the country's air bases, NATO's Allied Commander Europe Mobile Force deployed aircraft to eastern and southern Turkey. Some 42 machines arrived in January, including 18 Belgian Dassault Mirage 5 fighters, 18 German Dassault/Dornier Alpha Jet A attack aircraft and six Italian Lockheed RF-104G Starfighter reconnaissance jets. ❖



Even the USAF had insufficient resources to move the numbers of troops required as quickly as needed. This CRAF Boeing 747 is disgorging another load of US soldiers.

Wikimedia Commons



The Argentine contribution to the Coalition effort included this Alouette III, seen here coming aboard the hospital ship USNS *Comfort* during Desert Storm. JO1(SW) Joe Gawlowicz/US Navy



Owned by Air Zimbabwe, Affretair operated a small fleet of Douglas DC-8 freighters. Its aircraft were among the many chartered to support the movement of freight into theatre. RAF (AHB)/© UK MoD Crown Copyright 2016

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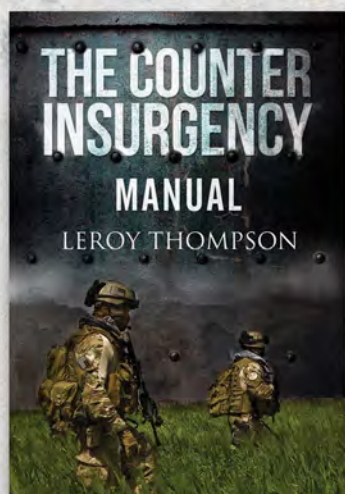
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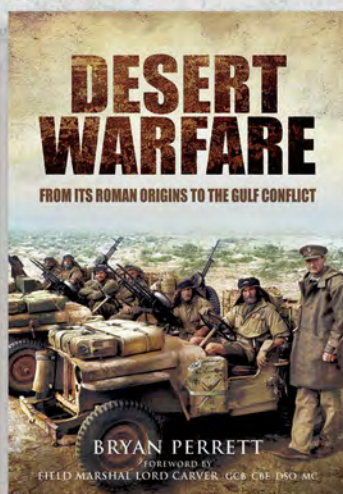


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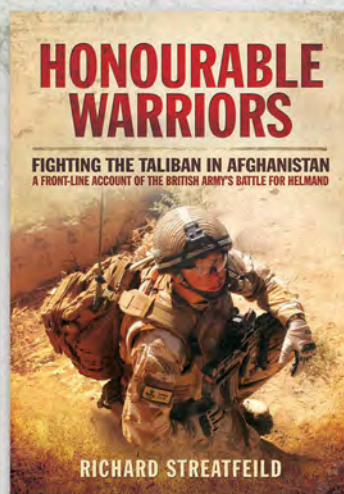
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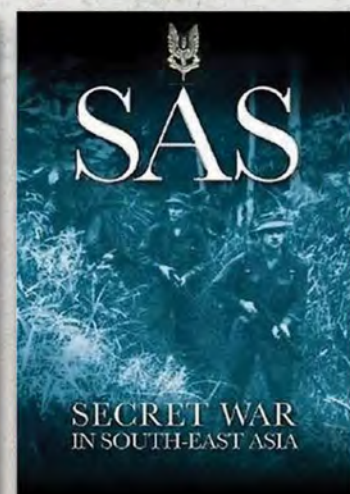
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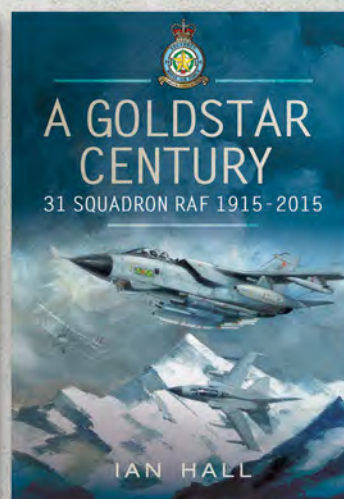
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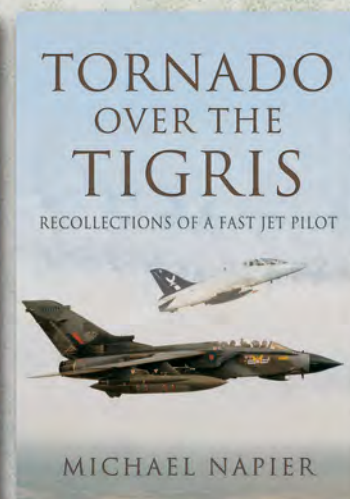
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